ELEMENTARY ARITHMETIC

SAMUEL HAMILTON

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ELEMENTARY ARITHMETIC

FOR GRADED AND UNGRADED SCHOOLS

BY

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NEW YORK ·:· CINCINNATI ·:· CHICAGO
AMERICAN BOOK COMPANY

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Entered at Stationers' Hall, London.

HAM. ELEM. AR.
W. P. 38

PREFACE

THE "Elementary Arithmetic" is intended to cover the work of the first five years. It is divided into four parts.

Part One includes the work ordinarily done during the *first and second years.*

Part Two includes the work of the *third year.* It is devoted mainly to the presentation of the elementary facts and tables of arithmetic.

The text-book should be placed in the hands of the pupil when he enters upon the work found in Part Two.

Part Three covers the work of the *fourth year.* Its purpose is to give a mastery of the fundamental operations, and, through the study of problems, to develop the ability to use these operations in a practical way.

Part Four includes the work of the *fifth year.* It gives an elementary treatment of Fractions, Decimals, Percentage, Interest, Denominate Numbers, and Practical Measurements.

The aim of this course is twofold: first, to give the child mathematical skill; second, to give him mathematical power.

To these ends attention is invited to the following:

1. The prominence given to drill intended to give skill, and the frequency of systematic reviews.

2. The Study of Problems intended to give mathematical power.

3. The plan which provides an easy treatment of each subject before the complete treatment of it.

4. The easy steps in gradation.

5. The emphasis given to business arithmetic.

6. The appeal made to observation as a stimulus to mathematical thought.

7. The abundance of exercises for oral drill.

The importance of *oral drill* has led the author to lay special emphasis on this kind of work. Pupils should be drilled thoroughly on the oral development and exercises in each subject, before taking up the written work.

In many schools the unit of classification is the half year. With this in view, the subject-matter in the third, fourth, and fifth years has been separated into two parts. The easy treatment of topics covers the first half of the year, and the more complete treatment the second half.

SAMUEL HAMILTON.

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ELEMENTARY ARITHMETIC

PART I — FIRST AND SECOND YEARS

COUNTING NUMBERS TO TEN

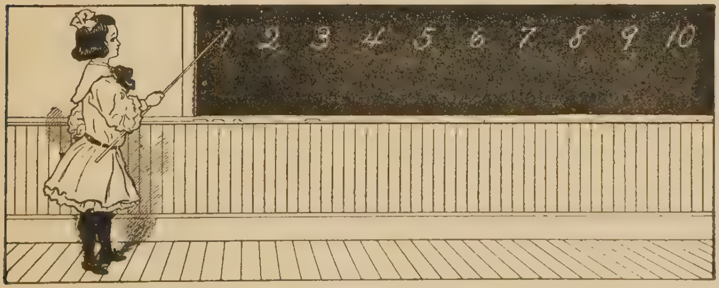
Count these balls. How many are there?

Count ten pupils. Count eight desks. Count nine books. Count the days of the week. How many are there?

Numbers are used to tell how many.

You have named *ten* numbers and you can write them either in words or in figures.

naught	one	two	three	four	five	six	seven	eight	nine	ten
0	1	2	3	4	5	6	7	8	9	10



THE NUMBERS TWO AND THREE

$2=\begin{matrix}1\\1\end{matrix}$	**Two 1's**	$3=\begin{matrix}1\\2\end{matrix}$	**Three 1's**

⊘ and ⊘ are ⊘ ⊘. ⊘ ⊘ and ⊘ are ⊘ ⊘ ⊘.

1. 1 ball and 1 ball are how many balls?

1 ball + 1 ball = 2 balls.

When you unite 2 and 1, you **add** them and the answer, 3, is called the **sum**.

The sign + is read **and** or **plus**. The sign = is read **equal** or **equals**. 2 + 1 = 3 is read 2 plus 1 equals 3.

2.

$$\begin{array}{rrrrrr} 1 & 1 & 2 & 1\text{ top} & 2\text{ cups} & 1\text{ car}\\ +2 & +1 & +1 & +2\text{ tops} & +1\text{ cup} & +2\text{ cars}\\ \hline & & & & & \textbf{Sum}\end{array}$$

3. John had 3 cents and lost one of them. How many cents had he left?

3 cents − 1 cent = 2 cents.

4. How many more balls are 3 balls than 2 balls?

3 balls less 2 balls = 1 ball.

You have **subtracted** 2 balls from 3 balls. The answer, 1 ball, is the **difference** or **remainder**.

The sign − is read **minus** or **less**. 3 − 2 = 1 is read 3 minus 2 equals 1.

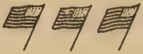
5. Subtract, beginning at the right:

$$\begin{array}{rrrrrl} 3 & 3 & 3 & 2 & 1 & \\ 1 & 3 & 2 & 1 & 1 & \\ \hline & & & & & \textbf{Difference or remainder}\end{array}$$

THE NUMBERS FOUR AND FIVE

4 =	1 3	2 2	Four 1's Two 2's	5 =	1 4	2 3	Five 1's

and are .

and  are .

1. Draw flags to show the following:

3 flags + 1 flag = ? 5 flags − 1 flag = ?
3 flags + 2 flags = ? 4 flags − 3 flags = ?

2. Count the flags by 2's. Two 2's = ?

3. 2 flags taken two times are —— flags.

4. How many times must 1 flag be taken to have 4 flags? 4 times 1 flag = —— flags.

5. 2 × 2 flags = —— flags.

The sign × is read **time** or **times**.

Give answers, reading across the page:

6. 1 × 1 5 × 1 1 × 2 2 × 2 3 × 1
7. 1 × 3 1 × 4 5 × 1 2 + 3 3 + 1
8. 1 + 4 4 − 1 5 − 2 4 − 3 1 + 4
9. 2 × 2 rings = —— 3 × 1 box = ——
10. 1 × 3 balls = —— 2 × 2 books = ——

To the Teacher. — Practice on similar work until pupils are thoroughly familiar with the combinations up to twelve.

LIQUID MEASURES

For this exercise a set of liquid measures should be used.

1. Fill the pint measure with water and empty it into the quart measure. Do this a second time. You have shown that **2 pints equal a quart.**

2. A quart is how many times a pint? A pint is what part of a quart?

3. Show by measuring with the quart measure that **4 quarts equal a gallon.**

4. A gallon is how many times a quart? A quart is what part of a gallon?

5. How many times can the teacher fill Mary's half-pint milk bottle from the pint measure?

6. Clare gets a pint of milk each morning and evening. How many pints does he get in two days?

7. Clare pays 2 cents for a pint of milk. How much does he pay for 2 pints?

8. Raymond delivers, each day, 4 quart bottles of milk. How many gallons does he deliver?

9. Henry goes to the store for 2 quarts of molasses. How many pints does he get?

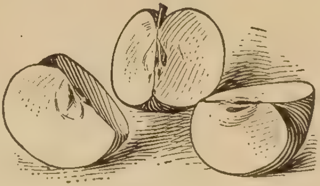
HALVES, THIRDS, AND FOURTHS

1. Cut an apple into 2 equal parts. What is one part called?

2. Into how many halves can an apple be cut? an orange? a pie?

One half of 1 is written $\frac{1}{2}$.

3. $\frac{1}{2}$ of 2 oranges = — orange; $\frac{1}{2}$ of 4 oranges = — oranges.



4. Cut an apple into 3 equal parts. What is 1 part called?

One third of 1 is written $\frac{1}{3}$.

5. $\frac{1}{3}$ of 3 pennies = ? $\frac{1}{2}$ of 4 splints = ?

6. Cut an apple into 4 equal parts. Each part is named one fourth, or one quarter.

One fourth of 1 is written $\frac{1}{4}$.

7. How many fourths of an apple make a whole apple?

8. Write in figures: one half; one third; one fourth.

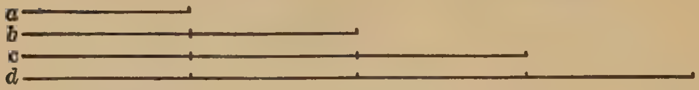
9. Find $\frac{1}{2}$ of 4 cents; $\frac{1}{3}$ of 3 cents; $\frac{1}{2}$ of 2 cents.

10. Find $\frac{1}{2}$ of 4; $\frac{1}{3}$ of 3; $\frac{1}{2}$ of 2; $\frac{1}{2}$ of 1; $\frac{1}{4}$ of 4.

11. Draw a circle showing halves; another showing thirds; one showing fourths.

COMPARISON

1. Which line is the shortest? the longest?



2. Which lines are shorter than *c*?

3. Which line is one half as long as *b*?

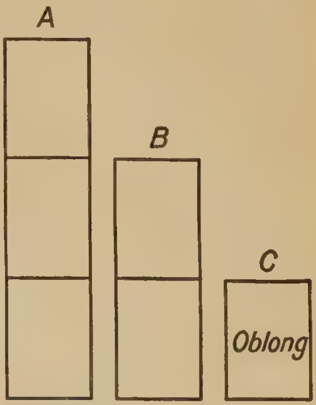
4. Which line is one fourth as long as *d*?

5. *A* is how many times as large as *C*?

6. How many times larger than *C* is *B*?

7. Are *A*, *B*, and *C* of the same width? How many square corners has each one?

8. How many sides of *A* have the same length?

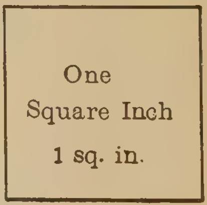


9. How many oblongs are there in *B*?

10. How many **equal sides** has this figure? how many square corners?

11. What is the name of the figure? How long is each side?

12. How many inches is it around the square?



13. One inch is what part of two inches?

14. Two inches are what part of 4 inches?

THE NUMBERS SIX AND SEVEN

6 =	1	2	3	Six 1's Three 2's Two 3's	7 =	1	2	3	Seven 1's
	5	4	3			6	5	4	

1. With convenient objects show these combinations:

5 marbles + 1 marble = ?
4 marbles + 3 marbles = ?
2 marbles + 4 marbles = ?
7 marbles − 4 marbles = ?
6 marbles − 1 marble = ?
7 marbles − 3 marbles = ?

2. Add:

2	2	2	4	4	5	3	4	0	2
4	5	3	1	3	1	2	2	6	2

3. Fill in the blank spaces and add:

( )	( )	( )	( )	( )	( )	( )	( )	( )	( )
5	2	4	3	3	3	2	1	6	1
6	5	7	6	5	4	7	6	6	5

4. Subtract:

7	6	6	6	7	7	7	6	6	7
6	5	3	1	5	2	4	2	4	3

5. Place six marbles in two equal groups; in three equal groups.

6. Give answers at sight:

3×2 2×3 7×1 $7 - 4$
$\frac{1}{2}$ of 6 $\frac{1}{3}$ of 3 $\frac{1}{4}$ of 4 $\frac{1}{3}$ of 6
$2 + 2 + 2 = ?$ $3 + 3 = ?$ $1 + 3 + 2 = ?$
$3 + 2 + 1 = ?$ 1 in 6, — times? $3 + 2 + 2 = ?$

THE NUMBERS EIGHT AND NINE

8 =	1	2	3	4	Eight 1's Four 2's Two 4's	9 =	1	2	3	4	Nine 1's Three 3's
	7	6	5	4			8	7	6	5	

1. With objects show the combinations that make 8; that make 9.

2. Count to 8 by 2's. $? \times 2 = 8$? $? \times 4 = 8$?

3. Count to 9 by 3's. $? \times 3 = 9$? $? \times 2 = 6$?

Add up, then down:

4.	4	3	2	7	2	3	4	5	6
	4	5	6	1	7	6	5	4	3

5.	3	4	2	2	1	3	0	2	3	4
	2	3	5	3	3	0	2	6	2	1
	3	1	1	3	4	5	6	1	4	4

6. From 9 take 8; take 7; 6; 5; 3; 2; 4; 1; 9.

7. Subtract:

8	8	6	8	8	7	8	8	8	8
3	7	3	1	6	5	4	8	5	2

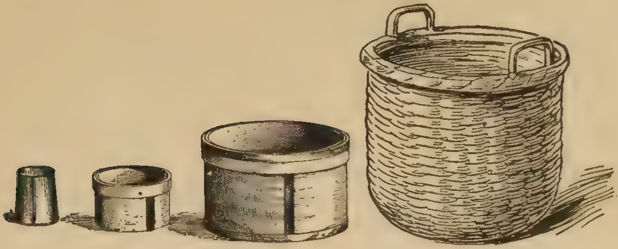
8. In 8 blocks, how many groups of 2's are there? In 9, how many groups of 3's are there?

1 time 2 = ?
3 times 3 = ? 2 is contained in 4, —— times.
3 times 2 = ? 3 is contained in 6, —— times.
$4 \times 2 = ?$ 2 is contained in 8, —— times.

9. $4 + 4 = ?$ $5 + 4 = ?$ $8 \div 4 = ?$ $\frac{1}{2}$ of $8 = ?$

10. $\frac{1}{3}$ of $6 = ?$ $\frac{1}{2}$ of $6 = ?$ $\frac{1}{3}$ of $9 = ?$ $\frac{1}{4}$ of $8 = ?$

DRY MEASURES



1. Name articles that you can purchase by the peck or by the bushel.

2. Why are these measures called "dry measures"?

3. The smallest dry measure shown in the picture is called a **pint**. Fill a pint measure with sand and empty it into the quart measure. Do this again. Is the quart measure now full? You have shown that **2 pints equal a quart.**

4. What part of a quart is a pint?

5. Show by measurement, as in example 3, that **8 quarts equal a peck.** A quart is what part of a peck?

6. Show as before that **4 pecks equal a bushel.** A peck is what part of a bushel?

7. A bushel is how many times a peck? A peck is how many times a quart?

8. Subtract:

8 qt.	7 qt.	8 pk.	6 pt.	8 bu.
4 qt.	3 qt.	3 pk.	4 pt.	5 bu.

THE NUMBERS TEN AND ELEVEN

10 =	1	2	3	4	5	Ten 1's Five 2's Two 5's	11 =	1	2	3	4	5	Eleven 1's
	9	8	7	6	5			10	9	8	7	6	

Illustrate the combinations with convenient objects or drawings.

1. Add up, then down:

1	0	2	0	1	1	4	3	2	4
2	4	3	3	9	6	5	1	5	7
8	6	5	7	1	4	2	6	2	0

2. From 10 take 3; take 5; 7; 8; 4; 2; 9.

3. Give missing numbers:

$4 + 4 + ? = 11$ $3 + 3 + 3 + ? = 11$ $2 \times 5, + ? = 11$
$5 + 5 + ? = 11$ $5 \times 2, + ? = 11$ $11 - 9 = ?$
$6 + 3 + ? = 11$ $6 \times 1, + ? = 11$ $11 - 4 = ?$

4. Name the piece of money that has the same value as ten pennies. **10 cents equal one dime.**

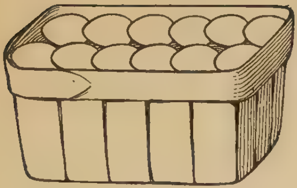
5. How many nickels equal 1 dime?

6. 5 dollars + 3 dollars + ? = 11 dollars.

The sign $ may be used for the word **dollar** or **dollars**, and the sign ¢ indicates **cent** or **cents**. $8 + $3 = ? $5 + $6 = ? $9 + $2 = ? 4¢ + 7¢ = ? 10¢ + 1¢ = ?

7. In 11, there are —— 4's and —— over.
In 11, there are —— 5's and —— over.
In 11, there are —— 3's and —— over.

THE NUMBER TWELVE



1. Draw 12 lines. Erase $\frac{1}{2}$ of them. What is $\frac{1}{2}$ of 12?

2. Count the eggs that you see in the basket.

3. What name is sometimes given to 12 eggs? to 12 pins? to 12 lemons?

12 things equal one dozen.

4. How many oranges equal $\frac{1}{3}$ of a dozen?

5. What number is doubled to make 12?

6. Make problems with:

4 × 3 cents
6 × 2 horses
$\frac{1}{2}$ of 12 peaches
3 × 4 apples
5 × 2 dollars
$\frac{1}{3}$ of 12 cars
2 × 6 games
2 × 4 cakes
$\frac{1}{4}$ of 12 apples

Subtract at sight:

7.	12	12	12	12	12	12	12	12
	3	4	5	6	7	8	9	2
8.	10	10	10	10	10	10	10	10
	2	3	4	5	6	7	8	9
9.	11	11	11	11	11	11	11	11
	3	4	5	6	7	8	9	2

10. Make problems with the above numbers.

WRITING AND READING NUMBERS

1. Count thirteen, written 13.

2. Count fourteen, written 14.

3. Count fifteen, written 15.

4. Write sixteen, seventeen, eighteen, nineteen.

The figure **0** is called **naught**, or **zero**. It stands for **nothing**. When placed to the right of 1, the figures stand for *ten*; when placed to the right of 2, the figures stand for *twenty*.

5. Count twenty-one, written 21; twenty-two, written 22; twenty-five, written 25.

6. Write twenty-six, twenty-seven.

7. Count thirty, written 30; forty, 40; fifty, 50; sixty, 60; seventy, 70; eighty, 80; ninety, 90.

Count ninety-nine, written 99.

8. Make a number board and write numbers to 99 thus:

The first column is made up of the ten digits.

0	10	20	30	40	50	60	70	80	90
1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99

9. Write in figures: Twenty-five, thirty-five, forty-three, seventy-three, sixty-four, eighty-four, fifty-five, seventy-six.

Twenty-five cents.
Forty-five cents.
Sixty dollars.
Seventy-one dollars.

READING NUMBERS

1. Read:

14	24	55	48	51	64	70	91	40
15	34	56	49	56	60	80	90	55
16	44	57	50	59	76	89	99	73

The right-hand figure in a number is called **ones'** figure; the second figure is called **tens'** figure.

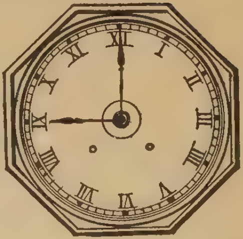
Point out the ones and the tens in each of the above numbers; thus, 14 is 1 ten and 4 ones.

Table of Combinations in Addition

In addition there are 45 different combinations of figures, taken two at a time, and 17 different sums or amounts. Use these combinations for drill frequently:

1 1		2 1		2 2	3 1		3 2	4 1		3 3	4 2	5 1
4 3	5 2	6 1		4 4	5 3	6 2	7 1		5 4	6 3	7 2	8 1
5 5	6 4	7 3	8 2	9 1					6 5	7 4	8 3	9 2
6 6	7 5	8 4	9 3		7 6	8 5	9 4			7 7	8 6	9 5
8 7	9 6		8 8	9 7			9 8					9 9

ROMAN NUMBERS TO TWENTY



1. The Romans wrote all numbers up to 49 with the use of three letters, I, V, X. I stands for 1; V stands for 5; X stands for 10.

2. This is how the Romans wrote their first twelve numbers:

1	2	3	4	5	6
I	II	III	IV	V	VI
7	8	9	10	11	12
VII	VIII	IX	X	XI	XII

3. Write the first twelve Roman numbers from memory.

4. Read the Roman numbers on the clock face. On clock faces IIII is used for IV.

5. Copy the following numbers:

13	14	15	16	17	18	19	20
XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX

6. Write in Roman numbers, 9. Show what change in the letters will make 11.

7. Write the Roman numbers from 1 to 20.

8. What time is it by the clock in the picture?

The short hand is called the **hour hand.** The long hand is called the **minute hand.**

9. Show the position of the hands at 30 minutes after 9; at 30 minutes after 10; at 30 minutes after 11.

ADDITION

State sums at sight:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*
1.	2	2	2	2	2	2	2	2	2	2
	76	82	74	62	50	41	53	64	30	72

2. Change the 2 above to 3 and add; then to 4:

3.	2	2	2	2	2	2	2	2	2	2
	85	65	75	55	45	63	73	93	43	83
4.	3	3	3	3	4	4	4	4	4	4
	59	49	69	79	49	38	48	88	78	58
5.	2	3	2	4	6	2	5	2	5	2
	4	2	0	3	2	3	2	4	3	5
	3	4	3	1	0	4	1	1	0	3

6. A boy spent 25 cents for a book and 12 cents for a slate. How much did he spend for both?

25 cents
12 cents
37 cents

Write *ones* under *ones* and *tens* under *tens*. Add the right-hand column and place the total, 7, underneath. Add the second column and write the total underneath. The answer is 37 cents.

7. Find the sum of:

25 apples and 63 apples
37 cakes and 42 cakes
81 lemons and 17 lemons
42 balls and 24 balls
24 boys and 15 boys
32 chairs and 26 chairs
47 books and 22 books
36 bats and 52 bats

Add:

	a	*b*	*c*	*d*	*e*	*f*	*g*
1.	20 30	30 10	40 10	50 20	60 10	30 40	50 30
2.	31 12	21 32	23 13	32 23	12 33	30 13	69 20
3.	42 21	44 23	44 24	43 34	14 44	33 23	82 14

Add upward; test by adding downward:

4.	$45 $14	$25 $33	$35 $54	$34 $35	$42 $45	$55 $33	$44 $22
5.	$16 $31	$45 $54	$67 $21	$72 $25	$81 $12	$83 $15	$59 $20

Only things having **like names** can be added.

	a	*b*	*c*	*d*	*e*
6.	17 boys 12 boys	36 caps 21 caps	56 balls 32 balls	35¢ 24¢	46 ft. 22 ft.

	a	*b*	*c*	*d*
7.	12 girls 10 girls 23 girls	34 men 22 men 41 men	14 tops 13 tops 21 tops	15 books 20 books 31 books
8.	14 cars 32 cars 22 cars	12 boxes 43 boxes 31 boxes	26 hats 42 hats 31 hats	16 days 22 days 41 days

ADDITION

1. There are 54 houses on one street and 28 on another. How many are there on both streets?

54 houses
28 houses
82 houses

Write *ones* under *ones* and *tens* under *tens*. Add the ones' column. The sum is 12 ones, or 1 ten and 2 ones. Write the 2 under the ones' column and add the 1 ten to the tens' column. 1 ten + 2 tens + 5 tens = 8 tens. The answer is 82 houses.

Add and test:

	a	*b*	*c*	*d*	*e*	*f*	*g*
2.	36	47	42	54	48	35	64
	25	24	39	36	34	27	28
3.	46	19	29	18	38	17	39
	36	24	10	36	17	46	45
4.	19	21	32	23	31	42	13
	14	19	4	15	43	16	46
	3	12	16	6	8	17	18
5.	11	16	19	41	39	42	15
	31	10	20	23	20	18	41
	29	49	17	18	18	20	38
6.	30	40	32	9	8	15	13
	17	19	30	14	20	20	68
	28	34	9	16	9	38	14

7. Count by 3's to 36; to 75. By 4's to 88.

ADDITION

1. Thomas has $24 in the bank and $17 in his pocket. How many dollars has he?

2. A farmer sold 26 bushels of apples on Monday, 35 bushels on Tuesday, and 30 bushels on Wednesday How many bushels did he sell in the three days?

3. On Tuesday a newsboy sold 28 morning papers and 44 evening papers. How many papers did he sell?

4. A girl had 42 cents left after spending 25 cents for ribbon and 10 cents for pins. How much money had she at first?

5. Mrs. Jackson spent $24 for a suit, $31 for a coat, and $12 for a hat. How much did all cost?

6. Fred planted 29 potatoes in one row, 31 in another, and 33 in a third row. How many potatoes did he plant all together?

7. Ned spent 35¢ for a ball, 25¢ for a bat, and 10¢ for car fare. How much did he spend?

8. The girls spent at the park, 15¢ for ice cream, 20¢ on the roller coaster, 35¢ in the picture gallery, and 12¢ for popcorn. How much did they spend for all?

9. It took Mary 16 minutes to sweep and dust the library, 12 minutes for the dining room, and 21 minutes for the parlor. How long did it take for the three rooms?

10. Edwin has 43 marbles, and Walter has 24 more than Edwin. How many marbles has Walter?

SUBTRACTION

1. Mary has 9 cents. She spends 5 cents. How many cents has she left?

2. A farmer had 7 cows. After selling a number he had 4 left. How many did he sell?

3. Anna had 15 towels to iron. When she had ironed 9, how many were left to iron?

4. Lucy had 12 roses and gave Mary 5 roses. How many roses had Lucy left?

Table of Combinations in Subtraction

In subtraction there are 45 different combinations of figures, taken two at a time. Use these combinations for drill frequently:

9 1	9 2	9 3	9 4	9 5	9 6	9 7	9 8	9 9
8 1	8 2	8 3	8 4	8 5	8 6	8 7	8 8	7 1
7 2	7 3	7 4	7 5	7 6	7 7	6 1	6 2	6 3
6 4	6 5	6 6	5 1	5 2	5 3	5 4	5 5	4 1
4 2	4 3	4 4	3 1	3 2	3 3	2 1	2 2	1 1

SUBTRACTION

1. James had 48 cents. He spent 25 cents. How many cents had he then?

48 cents
25 cents
23 cents

Write *ones* under *ones* and *tens* under *tens*. 8 ones − 5 ones = 3 ones. Write the three ones in ones' place. 4 tens − 2 tens = 2 tens. The answer is 23 cents.

Test.— 23 + 25 = 48.

Only **like numbers** can be subtracted.

Subtract and test:

	a	*b*	*c*	*d*	*e*	*f*	*g*
2.	44 22	38 13	56 13	64 21	49 23	65 32	45 23
3.	58 33	65 41	68 15	57 24	69 34	86 42	77 33
4.	77 44	88 55	75 25	96 46	87 53	94 41	52 40
5.	67 52	59 45	88 56	97 27	76 36	85 64	34 30
6.	99 38	96 74	87 64	79 38	98 84	77 63	59 50
7.	89 19	94 91	59 18	97 82	99 29	89 78	74 24

8. Make and solve 50 examples like the above.

PRACTICAL PROBLEMS

1. David is 14 years old and Walter is 7 years younger. How old is Walter?

2. Edna spent 35 cents for butter. She gave the clerk a half-dollar. How much change should she receive?

3. A postal clerk sold 43 postal cards one week, and 67 the next week. How many more did he sell in the second week than in the first week?

4. A man lives 68 miles from the city and has traveled 24 miles toward the city. How many miles has he yet to travel?

5. Tom drove home 78 cows and Ned 56. How many more cows were there in Tom's herd than in Ned's?

6. Edna had 78 pieces in her doll's dinner set, but 36 plates were broken. How many pieces remained?

7. Mr. Wilson's farm contains 76 acres of land, which is 14 acres more than his brother's farm contains. How many acres are there in his brother's farm?

8. William rode 27 miles on his bicycle on Thursday and 14 miles on Friday. How much farther did he ride the first day than the second?

9. Make problems with:

pupils	$	pictures	lamps	books
46 – 14	37 – 24	63 – 12	48 – 36	73 – 21
56 – 43	62 – 31	84 – 21	46 – 24	36 – 15

10. 34 children were invited to Kate's party. How many of them were absent, if only 22 of them attended?

MULTIPLICATION

1. What is the cost of two 2-cent pencils? 2 × 2¢ = ?

2. How much should you pay for three 2-cent apples? four 2-cent tops? five 2-cent stamps? six 2-cent papers?

3. James counted 2¢ seven times; thus, 2¢ + 2¢ + 2¢ + 2¢ + 2¢ + 2¢ + 2¢, and found that he had 14¢. He could have said *seven* 2's are 14, or 7 × 2 = 14.

4. Write in two other forms: 8 × 2 = 16; nine 2's = 18; 10 × 2 = 20.

5. Build the table of 2's thus:

Write the sum of each column beneath it. Look at each column. See how many 2's it contains. Say,
1 × 2 = 2; 2 × 2 = 4; 3 × 2 = 6; 4 × 2 = 8; 5 × 2 = 10; 6 × 2 = 12; etc.

$$\begin{array}{cccccc} &&&&&2\\ &&&&2&2\\ &&&2&2&2\\ &&2&2&2&2\\ &2&2&2&2&2\\ 2&2&2&2&2&2\\ \hline \end{array}$$

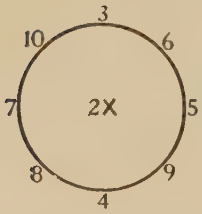
6. Find products:

5 × 2 caps
6 × 2 dolls
8 × 2 plums
3 × 2 hats
9 × 2 birds
7 × 2 birds
4 × 2 cups
2 × 2 hats

7. Memorize the table.

Table of 2's

1 × 2 = 2
2 × 2 = 4
3 × 2 = 6
4 × 2 = 8
5 × 2 = 10
6 × 2 = 12
7 × 2 = 14
8 × 2 = 16
9 × 2 = 18
10 × 2 = 20



8. Multiply each number outside the circle by 2.

1. How many are two 7's? two 10's?

2. Write these two problems in two other ways.

3. How many are two 34's? This may be written:

$$34 + 34 = 68, \text{ or } \begin{array}{r} 34 \\ +\underline{34} \\ 68, \text{ sum.} \end{array}$$

The sum of two 34's is 68.

4. A shorter process for finding two 34's is by multiplication; written thus,

$$\begin{array}{r} 34 \\ \underline{\times 2} \\ 68 \end{array}$$

Write the multiplier 2 under the right-hand figure of the number to be multiplied, which is 34. Beginning at the right, say 2 × 4 = 8. Write 8 in ones' place in the answer. 2 × 3 = 6. Write 6 in tens' place in the answer. The result is 68. **Test** by addition, 34 + 34 = 68.

Multiply, and test by addition:

	a	*b*	*c*	*d*	*e*	*f*
5.	23 2	54 2	53 2	64 2	71 2	62 2
6.	40 2	81 2	94 2	70 2	63 2	53 2
7.	93 2	72 2	62 2	53 2	82 2	91 2
8.	44 2	32 2	83 2	24 2	84 2	74 2
9.	11 2	73 2	22 2	33 2	92 2	44 2

DIVIDING BY 2

1. // // // // // Count the splints by 2's. How many times must two splints be taken to have 10 splints? 10 splints contain 2 splints —— times.

2. 6 contains 2 —— times. 8 contains 2 —— times. 12 contains 2 —— times.

3. Into how many groups of two each may 10 be divided? 10 divided by 2 equals 5, written
$10 \div 2 = 5$, or $\begin{array}{r} 2\overline{)10} \\ 5 \end{array}$. The sign $\div$ is read **divided by.**

Read, and give answers:

4. $4 \div 2$; $6 \div 2$; $8 \div 2$; $10 \div 2$.

5. $2\overline{)8}$; $2\overline{)10}$; $2\overline{)6}$; $2\overline{)12}$.

6. Divide 24 by 2.

$$\begin{array}{r} 2\overline{)24} \\ 12 \end{array}$$

2 is contained in 2 tens, 1 ten time; write 1 in tens' place. 2 is contained in 4 ones, 2 times; write 2 in ones' place. The answer is 12.

Find the answers:

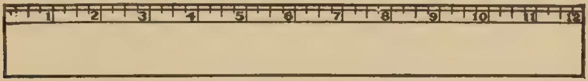
	a	*b*	*c*	*d*	*e*
7.	$2\overline{)22}$	$2\overline{)24}$	$2\overline{)26}$	$2\overline{)44}$	$2\overline{)20}$
8.	$2\overline{)28}$	$2\overline{)40}$	$2\overline{)48}$	$2\overline{)42}$	$2\overline{)46}$
9.	$2\overline{)62}$	$2\overline{)66}$	$2\overline{)60}$	$2\overline{)64}$	$2\overline{)68}$
10.	$2\overline{)80}$	$2\overline{)84}$	$2\overline{)88}$	$2\overline{)86}$	$2\overline{)82}$

MEASURING LENGTH

For this exercise the teacher should secure a foot rule and a yard stick.

1. Examine a **foot** rule. Observe that it is divided into 12 equal spaces. Each space is called **one inch.** A foot rule is therefore 12 inches long.

2. The following represents a foot rule, although it is only one fourth the real length. Count the number of inch spaces.



3. Cut from cardboard a foot rule and mark the inches on it.

4. With the rule draw a line 1 inch long; 4 inches long.

5. How many inches equal $\frac{1}{2}$ of a foot? $\frac{1}{3}$ of a foot? $\frac{1}{4}$ of a foot?

6. Draw an oblong 12 inches long and 8 inches wide. How many inches is it around the oblong?

7. Draw a 2-inch square. How many inches is it around the square?

8. Measure a yard stick with your foot rule. This shows that there are **3 feet in a yard.**

9. Mark off with the yard stick on the blackboard a line 1 foot in length; 2 feet in length; 1 yard in length.

10. How many feet equal 2 yards? $\frac{1}{3}$ of a yard?

REVIEW

1. A man paid $ 80 for 2 cows. How many dollars did each cost?

2. A family bought 48 pints of milk in a month. How many quarts did they buy?

3. How much will 2 lb. of tea cost at 40¢ a pound?

4. How many 2-cent stamps can be bought for 64 cents?

5. Eva paid 86 cents for 2 yards of linen. What was the cost of 1 yard?

6. If Ruth takes 2 piano lessons every week, how many does she take in 44 weeks?

7. A girl is 14 years old. Her brother is twice as old. How old is her brother?

8. How many pints are there in 44 quarts?

9. If a clerk earns $ 44 a month, how much will he earn in 2 months?

10. Dick has 68 cents. He gives 35 cents to Kate. How many cents has he left?

11. If molasses costs 14 cents a pint, how much will a quart cost?

Find the cost of:

12. 2 pieces of soap at 10 cents a piece.
13. 2 pounds of butter at 24 cents a pound.
14. 2 dozen lemons at 12 cents a dozen.
15. 2 yards of muslin at 11 cents a yard.

PART II—THIRD YEAR

READING AND WRITING NUMBERS

1. Count to one hundred. One hundred is written 100

2. Count to one hundred one, written 101.

3. Write in figures: one hundred four; one hundred five; one hundred seven.

4. Read, then write in words: 103, 105, 107, 109.

5. Add 100 to 100. The sum is two hundred, written 200. Add 200 to 100. The sum is three hundred, written 300.

6. Read, then write in words: 400, 500, 601, 700, 802, 900, 501, 404.

Read:

	a	*b*	*c*	*d*	*e*
7.	109	309	506	836	707
8.	110	310	340	741	888
9.	112	311	765	952	999

The largest number that can be written with three figures is 999. The next number is one thousand, written 1000.

Write in figures:

10. Two thousand.

11. Five thousand.

12. Six thousand.

13. Seven thousand.

14. Eight thousand.

15. Nine thousand.

16. Add 1 to 1000. The sum is one thousand one, written 1001.

Write in figures:

17. One thousand two.
18. One thousand nine.
19. One thousand six.
20. One thousand seven.
21. One thousand eight.
22. One thousand three.

The first figure on the right is called the **ones'** figure; the next is called the **tens'** figure; the next is called the **hundreds'** figure; the next is called the **thousands'** figure. The **tens** are always read as so many **ones.** Thus, 1625 is read, "1 thousand, 6 hundred, 25." In 25, the 2 tens are read as 20.

Read, then write:

	a	*b*	*c*	*d*	*e*
23.	1025	2040	7028	1010	8099
24.	1125	2141	9208	1011	8999
25.	1139	3005	6721	2111	9999
26.	2014	4020	6099	7509	8001

Write as one number:

27. 6 hundreds, 4 tens, 8 ones.

28. 8 thousands, 5 hundreds, 3 tens, 3 ones.

29. 4 thousands, 0 hundreds, 8 tens, 5 ones.

30. 5 thousands, 0 hundreds, 0 tens, 9 ones.

31. 9 thousands, 4 hundreds, 0 tens, 5 ones.

ADDITION

(Review pages 17 to 20)

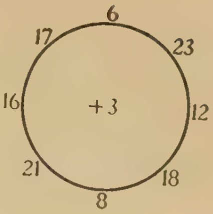
1. Count from 2 to 100 by 2's.

2. Count from 1 to 101 by 2's.

3. Count from 3 to 102 by 3's.

4. Count from 4 to 100 by 4's.

5. Count from 1 to 101 by 4's.



6. Add the number in the center to each number outside the circle.

7. Add 3 to each of the following numbers; then 4; then 5:

24	34	44	55	65	75
36	46	56	66	76	86
47	67	27	38	58	78

Find sums. Test by adding downwards:

	a	*b*	*c*	*d*	*e*
8.	23 13 43	32 23 43	42 32 44	45 51 54	51 42 14
9.	44 55 33	21 32 12	53 32 43	32 24 32	31 24 32

The process of uniting two or more numbers to form one number is called **addition**.

The numbers united are called **addends**.

The answer in addition is called the **sum** or **amount**.

ADDITION

1. Add 234, 359, and 266.

234 = 2 hundreds + 3 tens + 4 ones
359 = 3 hundreds + 5 tens + 9 ones
266 = 2 hundreds + 6 tens + 6 ones
859 = 7 hundreds + 14 tens + 19 ones.

19 ones = 1 ten and 9 ones. Write the 9 in ones' place and carry the 1 ten to tens' place. 14 tens + 1 ten = 15 tens. Write the 5 in tens' place and carry the 1 to hundreds' place. 7 hundreds + 1 hundred = 8 hundreds.

Write from dictation, then add and test:

	a	*b*	*c*	*d*	*e*	*f*
2.	234	230	101	231	301	243
	326	325	304	405	226	206
	434	265	376	568	304	306
3.	405	304	604	400	291	905
	304	349	787	697	743	634
	296	200	342	345	456	393
4.	623	344	23	509	20	502
	5	593	906	5	102	205
	340	25	25	820	67	50
5.	708	931	68	7	423	791
	55	67	834	751	92	8
	634	8	436	534	899	958

ADDITION

Add rapidly:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*	*k*	*l*	*m*	*n*
1.	5	4	3	2	1	9	8	7	6	5	8	3	2	1
	9	8	6	3	2	0	5	2	7	3	7	5	3	9
	0	1	2	5	6	2	6	7	9	0	3	7	3	0
	1	8	0	4	3	6	1	6	8	3	9	8	0	1
	8	3	6	8	5	6	3	8	4	3	4	6	5	7
	7	6	5	0	5	9	8	1	5	9	6	0	8	6
	2	5	9	9	8	2	7	3	2	9	3	8	9	5
	6	9	3	1	0	4	3	7	1	0	5	9	4	3

Write from dictation, then add:

	a	*b*	*c*	*d*	*e*	*f*	*g*
2.	305	542	740	8	70	79	500
	79	67	90	48	84	342	7
	6	500	708	600	395	9	48
	394	9	502	540	4	805	6
3.	562	807	60	536	28	42	62
	9	58	547	67	906	790	203
	645	6	44	25	627	7	636
	834	526	782	981	8	856	93
4.	390	300	29	6	602	90	67
	59	5	330	306	74	67	500
	508	794	57	27	909	80	395
	74	896	8	407	40	395	70
	380	25	901	92	29	74	5

ADDITION

1. Find the sum of 2430, 4307, and 68.

2430 = 2 thousands + 4 hundreds + 3 tens + 0 ones
4307 = 4 thousands + 3 hundreds + 0 tens + 7 ones
68 = 0 thousands + 0 hundreds + 6 tens + 8 ones
6805 = 6 thousands + 7 hundreds + 9 tens + 15 ones.

15 ones = 1 ten + 5 ones. 1 ten + 9 tens = 10 tens or 1 hundred. 1 hundred + 7 hundreds = 8 hundreds. 4 thousands + 2 thousands = 6 thousands.

Write from dictation, then add:

	a	*b*	*c*	*d*	*e*
2.	23	378	298	1008	603
	604	49	342	49	2798
	3068	3067	6781	706	6987
3.	1304	2004	4987	3740	6425
	279	3050	9	609	4020
	6000	50	807	4203	205
	200	674	5002	6001	1347
4.	6870	5475	64	21	3006
	2	2681	370	2102	2904
	3078	5004	4274	3478	799
	2690	79	5007	9	6094

5. 2 + 3 + 7 + 9 + 6 = ?

6. 6 + 0 + 7 + 8 + 5 = ?

7. 7 + 6 + 5 + 2 + 6 + 7 = ?

8. 5 + 4 + 3 + 8 + 6 + 9 = ?

ADDITION

Write from dictation, then add:

1. Twenty-five; two hundred twenty-five; three hundred fifty.

2. Four hundred two; seventy-three; nine; five hundred sixty.

3. Four thousand twenty; six hundred six; five.

4. Six hundred ninety; ten; three hundred; two thousand four.

5. Two hundred eighty; nineteen; six; one thousand.

6. 230 + 65 + 100 + 405.

7. 300 + 9 + 25 + 500.

8. 65¢ + 10¢ + 100¢ + 1000¢.

9. $ 42 + $ 504 + $ 105 + $ 3.

10. 24 pt. + 120 pt. + 7 pt. + 36 pt.

11. 1000 qt. + 14 qt. + 135 qt. + 10 qt.

12. 174 pk. + 130 pk. + 5 pk. + 800 pk.

13. 1200 in. + 10 in. + 100 in. + 20 in.

14. 60 dimes + 4000 dimes + 4 dimes + 300 dimes.

15.	**16.**	**17.**	**18.**
2000 hours	1370 minutes	40 gallons	409 days
146 hours	234 minutes	209 gallons	3090 days
9 hours	30 minutes	2900 gallons	9 days
3472 hours	605 minutes	4 gallons	374 days

ADDITION

Read and solve:

1. 2465 + 3642 + 4612 + 5534 + 6342 = ?
2. 4756 + 3254 + 4321 + 4132 + 3536 = ?
3. 4234 + 3512 + 2435 + 1543 + 2453 = ?
4. 5243 + 2453 + 3215 + 4123 + 4231 = ?
5. 6314 + 1355 + 2652 + 1623 + 3245 = ?
6. 7664 + 2845 + 6246 + 3664 + 4554 = ?
7. 6050 + 4004 + 1804 + 4536 + 6143 = ?
8. 3652 + 4630 + 5672 + 3867 + 5468 = ?
9. 4876 + 6724 + 4116 + 3442 + 4162 = ?
10. 3640 + 4466 + 7201 + 404 + 162 = ?

11. A carpenter had 23 men and hired 13 more. How many had he then?

12. Mr. Jones deposited $ 123 in a bank on Monday; $ 232 on Tuesday; and $ 321 on Wednesday. How much did he deposit in the three days?

13. A ship sailed 223 miles the first day, 320 miles the second, and 231 miles the third. How many miles did it sail?

14. A farmer raised 230 bushels of wheat, 122 bushels of corn, 112 bushels of oats, and 323 bushels of rye. How many bushels of grain did he raise?

15. Mrs. Foster bought a bedroom set of furniture for $ 125, a piano for $ 350, curtains for $ 52, pictures for $ 128, and a rug for $ 23. How much did they all cost?

SUBTRACTION

(Review pages 21 to 23)

Give differences:

1.	7	6	5	4	13	8	9	11	10
	−4	−5	−2	−3	−8	−4	−5	−3	−3
2.	13	6	8	9	7	10	12	11	8
	−6	−3	−3	−7	−2	−7	−4	−5	−2
3.	8	9	7	15	5	12	11	17	8
	−6	−8	−5	−7	−4	−9	−7	−9	−7
4.	9	13	8	9	10	12	11	12	7
	−6	−5	−5	−2	−8	−7	−4	−6	−6
5.	13	14	10	12	9	10	11	12	15
	−9	−8	−9	−2	−3	−4	−8	−8	−8
6.	16	15	13	14	15	16	14	12	11
	−8	−9	−7	−7	−6	−9	−9	−3	−6

Give answers quickly:

7. 8 − 3; 18 − 3; 28 − 3; 48 − 3; 58 − 3; 88 − 3.

8. 11 − 4; 21 − 4; 31 − 4; 41 − 4; 51 − 4; 61 − 4.

9. 9 − 5; 49 − 5; 59 − 5; 89 − 5; 69 − 5; 79 − 5.

10. 7 − 6; 17 − 6; 27 − 6; 37 − 6; 47 − 6; 97 − 6.

11. 13 − 7; 23 − 7; 33 − 7; 43 − 7; 53 − 7; 83 − 7

12. 15 − 8; 25 − 8; 35 − 8; 45 − 8; 55 − 8; 75 − 8

13. 26 − 9; 36 − 9; 46 − 9; 56 − 9; 66 − 9; 96 − 9

SUBTRACTION

1. From 83 subtract 35.

$$\begin{array}{lr} 83 = 8 \text{ tens} + 3 \text{ ones, or} & 7 \text{ tens} + 13 \text{ ones} \\ \underline{35} = & \underline{3 \text{ tens} + 5 \text{ ones}} \\ 48 = & 4 \text{ tens} + 8 \text{ ones.} \end{array}$$

Since 5 ones cannot be taken from 3 ones, take 1 ten (= 10 ones) from the 8 tens (leaving 7 tens) and add it to the 3 ones, making 13 ones. 13 ones less 5 ones equal 8 ones. 7 tens (remaining) less 3 tens equal 4 tens.

Before subtracting, the work may be expressed thus:

We think: "5 from 13 leaves 8; 3 from 7 leaves 4; 48."

$$\begin{array}{r} \overset{7}{8}\ \overset{13}{3} \\ \underline{3\ 5} \end{array}$$

Test. — 48 + 35 = 83.

The process of finding the difference between two numbers is called **subtraction.**

The number from which we subtract is called the **minuend**; the number subtracted is called the **subtrahend**; the result is called the **difference** or **remainder**.

Subtract, and test each result:

	a	*b*	*c*	*d*	*e*	*f*	*g*
2.	63	92	84	57	84	34	91
	27	69	39	38	49	17	54
3.	48	74	81	63	92	86	84
	29	47	29	44	74	58	45
4.	55	80	31	61	21	34	47
	19	27	18	57	13	16	38

Subtract and test:

	a	b	c	d	e	f
1.	769	819	346	665	749	864
	374	568	94	374	298	539
2.	332	748	552	175	729	534
	140	339	429	68	549	360

3. Make, solve, and test 200 problems like the above.

4. From 803 subtract 576.

7 9 13
803 = 7 hundreds + 9 tens + 13 ones
576 = 5 hundreds + 7 tens + 6 ones
227 = 2 hundreds + 2 tens + 7 ones.

Take 1 hundred from 8 hundreds; this leaves 7 hundreds. 1 hundred equals 10 tens. Take 1 ten from 10 tens; this leaves 9 tens. 1 ten and 3 ones are 13 ones. 803 then is equal to 7 hundreds, 9 tens, and 13 ones. 13 ones − 6 ones = 7 ones; 9 tens − 7 tens = 2 tens; 7 hundreds − 5 hundreds = 2 hundreds. *Answer*, 227.

Read, then subtract and test:

	a	b	c	d	e
5.	8404	7604	5041	5202	7011
	3625	4896	1979	1824	4583
6.	7024	8401	5401	8704	4087
	3767	4574	2519	6247	1069

7. Subtract 187 from 9234; then take 187 from each successive remainder, until the final remainder is 7364.

SUBTRACTION

1. From 700 take 264.

6 9 10
700 = 6 hundreds + 9 tens + 10 ones
264 = 2 hundreds + 6 tens + 4 ones
436 = 4 hundreds + 3 tens + 6 ones.

	a	*b*	*c*	*d*	*e*	*f*
2.	500	600	900	400	800	700
	154	247	678	197	372	309
3.	300	700	600	800	200	400
	263	288	327	561	181	397
4.	604	809	701	902	606	705
	160	341	202	720	408	496
5.	609	501	303	806	903	703
	285	209	180	199	287	587
6.	706	801	704	560	601	890
	567	560	395	297	269	798
7.	2042	4106	5001	8012	7020	1407
	1012	2014	3014	5707	2904	1289
8.	7018	5080	9001	8304	4400	1604
	4009	3107	3082	5012	3870	1397

SUBTRACTION

Subtract:

	a	*b*	*c*	*d*	*e*
1.	6432 4176	7244 5371	6475 3879	7994 3877	8641 1282
2.	4531 1522	4351 1543	4234 1235	2432 1344	2134 1545
3.	5423 2545	4215 1567	3254 1565	3524 1566	8231 4743
4.	4253 1464	3231 1865	5453 1974	8121 3642	6414 3892

5. 412 boys and 325 girls were enrolled in a school. How many more boys than girls were enrolled?

6. Harry has 42 chickens. After he has fed 15 of them, how many chickens remain to be fed?

7. John's home is 132 miles from New York, and Mary's home is 341 miles from New York. How many miles farther from New York does Mary live than John?

8. The **perimeter** or distance around a dining table is 28 feet and that of the library table is 21 feet. Find the difference in the perimeters.

9. An automobile ran 312 miles one week and 145 miles the next week. How many more miles did the automobile run the first week than the second week?

ADDITION AND SUBTRACTION

1. In the Central School, there are 398 pupils; in the Garfield School, 1045, and in the Holmes School, 2306. How many pupils are there in the three schools?

2. Mr. Adams's home cost $4370, and Mr. Boyd's cost $3745. Find the difference in the cost of their homes.

3. John lives 5906 feet from his school, and Thomas lives 2194 feet nearer the school than John. How far does Thomas live from the school?

4. Bertha counted the people in four parades. In the first there were 208; in the second, 890; in the third, 1506; and in the fourth, 1781. How many were there in all?

5. In two city schools, boys parade as soldiers. In the first school there are 1790 boys; in the second school 279 boys less than in the first. How many boys are there in the second school?

6. A merchant sold for the fourth of July, 3706 small flags, 1712 larger flags, and 19 flags for flag poles. How many flags did he sell?

7. In counting the steps to school, Joseph took 1370, and Harvey took 940 less than Joseph. How many steps did Harvey take?

8. A street-car conductor collected 103 fares on the first trip, 72 on the second trip, 176 on the third trip, and 39 on the fourth trip. How many fares did he collect?

MULTIPLYING BY 3

1. Count by 2's to 36; by 3's to 36.

2. How many are 3 + 3, or two 3's? 3 + 3 + 3, or three 3's? 3 + 3 + 3 + 3, or four 3's?

3. Three 3's are ——; five 3's are ——; six 3's are ——; nine 3's are ——.

4. How many are 7 × 3? 5 × 3?

5. Build the table of 3's to 12 × 3 thus: Write the sum of each column beneath it. Look at each column and say, 1 × 3 = 3; 2 × 3 = 6; 3 × 3 = 9; etc.

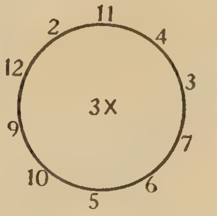
```
            3
          3 3
        3 3 3
      3 3 3 3
    3 3 3 3 3
  3 3 3 3 3 3
3 3 3 3 3 3 3
-------------
```

6. 3 × 8 = 8 × ? 3 × 5 = 5 × ? 9 × 3 = 3 × ?

Table of 3's

1 × 3 = 3	7 × 3 = 21
2 × 3 = 6	8 × 3 = 24
3 × 3 = 9	9 × 3 = 27
4 × 3 = 12	10 × 3 = 30
5 × 3 = 15	11 × 3 = 33
6 × 3 = 18	12 × 3 = 36

7. Memorize the table.



Multiply at sight:

8. Give products.

9.	4	2	5	7	9	8	6	10	11
	3	3	3	3	3	3	3	3	3
10.	12	20	40	30	50	70	60	90	80
	3	3	3	3	3	3	3	3	3

MULTIPLYING BY 3

1. Multiply 65 × 3.

Multiplicand	65
Multiplier	3
Product	195

3 × 5 ones = 15 ones, or 1 ten and 5 ones. Write the 5 ones in ones' place. 3 × 6 tens = 18 tens; 18 tens + the 1 ten of the 15 ones = 19 tens. The answer is 195.

Test. — 65
65
65
195

We think: "3 times 5 = 15; 3 times 6 = 18; 18 + 1 = 19." Product 195.

The number multiplied is called the **multiplicand.** The number showing how many times the multiplicand is taken is called the **multiplier.** The result in multiplication is called the **product.**

Multiply, and test each product by addition:

	a	*b*	*c*	*d*	*e*
2.	45 3	75 3	66 3	74 3	86 3
3.	135 3	105 3	216 3	308 3	207 3
4.	236 3	409 3	237 3	258 3	189 3
5.	209 3	146 3	284 3	167 3	248 3
6.	132 3	145 3	298 3	276 3	287 3

MULTIPLICATION OF CONCRETE NUMBERS

Numbers that name objects are **concrete**; as 6 apples, 3 boys, 5 yards.

Numbers that do not name objects are **abstract**; as 7, 9, 3.

In multiplying concrete numbers, the multiplicand and the product have the same name.

The multiplier is always an **abstract** number.

1. How many oranges are there in 3 dozen?

12 oranges in 1 doz.
3
36 oranges in 3 doz.

3 × 12 oranges = 36 oranges.

Multiply:

	a	*b*	*c*	*d*
2.	46¢ 3	24 cans 3	56 balls 3	28 qt. 3
3.	25 ft. 3	28 pt. 3	47 gal. 3	82 yd. 3
4.	96 da. 3	84 min. 3	75 poles 3	48 miles 3
5.	93 trees 3	88 dimes 3	52 eggs 3	93 birds 3
6.	86 wheels 3	48 cakes 3	72 pies 3	197 nuts 3

MULTIPLYING BY 4

1. Count by 4's to 12; to 24; to 36; to 48.

2. How many are 4 + 4, or two 4's? 4 + 4 + 4, or three 4's? 4 + 4 + 4 + 4, or four 4's?

3. Five 4's are ——; six 4's are ——.

4. How many are 2×4? 4×4? 5×4?

5. Build the table of 4's to 12×4 thus: Write the sum of each column beneath it. Look at each column and say, $1 \times 4 = 4$; $2 \times 4 = 8$; $3 \times 4 = 12$; etc.

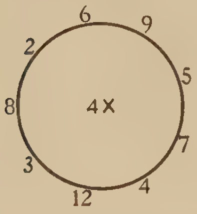
$$\begin{array}{r} 4 \\ 4\ 4 \\ 4\ 4\ 4 \\ 4\ 4\ 4\ 4 \\ 4\ 4\ 4\ 4\ 4 \\ \underline{4\ 4\ 4\ 4\ 4\ 4} \end{array}$$

6. $4 \times 8 = ? \times 4$ $9 \times 4 = 4 \times ?$ $6 \times 4 = ? \times 6$.

7. Memorize the table.

Table of 4's

1 × 4 = 4	7 × 4 = 28
2 × 4 = 8	8 × 4 = 32
3 × 4 = 12	9 × 4 = 36
4 × 4 = 16	10 × 4 = 40
5 × 4 = 20	11 × 4 = 44
6 × 4 = 24	12 × 4 = 48



8. Give products.

9. Give products at sight:

3	5	7	9	11	12	4	6	8
4	4	4	4	4	4	4	4	4

10. 4 × 5 3 × 8 4 × 10 4 × 7 2 × 9

11. 3 × 6 4 × 12 3 × 2 3 × 10 4 × 4

12. 4 × 11 4 × 2 3 × 10 4 × 9 4 × 3

PRACTICAL PROBLEMS

1. Emma has 4 pieces of ribbon of 10 yards each. How many yards has she in all?

2. How many lemons are there in 4 dozen?

3. How far can you ride in 4 hours in a carriage that travels on an average of 4 miles an hour?

4. How many pecks are there in 11 bushels?

5. At 10¢ a quart, how much will 1 gal. oil cost?

6. How many days are there in 4 weeks?

Multiply, and test by addition:

	a	*b*	*c*	*d*	*e*
7.	165 4	238 4	369 4	748 4	569 4
8.	293 4	687 4	574 4	862 4	738 4
9.	786 4	934 4	867 4	279 4	184 4
10.	915 4	846 4	739 4	862 4	475 4
11.	886 4	995 4	774 4	663 4	552 4

Give products at sight:

12. 4 × 20 4 × 50 4 × 80 4 × 25 4 × 17

13. 4 × 30 4 × 60 4 × 90 4 × 15 4 × 18

PRACTICAL PROBLEMS

1. If a sail maker uses 18 yards of cloth in a mainsail, how many yards would he require for 3 such sails?

2. If it takes Helen 24 minutes to hemstitch a collar, how many minutes will it take for 4 collars?

3. A man bought 4 lots at $475 each. How much did they cost?

4. Mr. Horne made 3 payments of $645 each for his house. What was the cost of his house?

5. If each pupil in a school of 658 has 4 books, how many books have they all?

6. A drover bought 3 horses at $235 each. How much did he pay for all?

7. A farmer sold 276 sheep at $4 a head. How much did he receive for all?

8. If a train runs 476 miles in a day, how far can I travel on it in 3 days?

9. A ship sailed 364 miles each day. How far did it sail in 4 days?

10. A car carries 60 persons. How many persons will 4 such cars carry?

11. How many acres are there in 4 farms, if each farm contains 175 acres?

12. At $15 each, how much will 3 paintings cost?

13. How many boys are playing soldier, if there are 4 rows and 16 boys in each row?

DIVIDING BY 3

1. Count by 3's to 9; to 18; to 30; to 36.

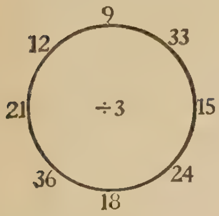
2. How many times does 6 contain 3? ||| |||

3. Show by separating into groups:

12 contains 3 —— times   15 contains 3 —— times
18 contains 3 —— times   21 contains 3 —— times

4. Give quotients at sight:

9 ÷ 3	18 ÷ 3	33 ÷ 3	12 ÷ 3	27 ÷ 3
24 ÷ 3	30 ÷ 3	21 ÷ 3	36 ÷ 3	15 ÷ 3



5. Divide each number outside the circle by 3.

6. Find:

$\frac{1}{3}$ of 27	$\frac{1}{3}$ of 30	$\frac{1}{3}$ of 36	$\frac{1}{3}$ of 15
$\frac{1}{3}$ of 12	$\frac{1}{3}$ of 18	$\frac{1}{3}$ of 21	$\frac{1}{3}$ of 33

7. Compare 6 and 2; thus: 6 is 3 times 2. 2 is $\frac{1}{3}$ of 6.

The number divided is called the **dividend.**
The number by which we divide is called the **divisor.**
The answer in division is called the **quotient.**

Divide and test:

	a	*b*	*c*	*d*	*e*
8.	3)24	3)36	3)27	3)30	3)21
9.	3)393	3)363	3)339	3)933	3)303
10.	3)150	3)900	3)660	3)693	3)369

1. The sign ÷ is read **divided by.**

2. 24¢ ÷ 3¢ means that we are to find *how many times* 3¢ is contained in 24¢; thus: $3¢\overline{)24¢}$
8 times.

Find quotients:

3. 82 days ÷ 2 days
4. 186 hours ÷ 3 hours
5. 422 minutes ÷ 2 minutes
6. 448 feet ÷ 2 feet
7. 249 inches ÷ 3 inches
8. 622 dollars ÷ 2 dollars
9. 189 years ÷ 3 years
10. 244 roses ÷ 2 roses
11. 664 cents ÷ 2 cents
12. 336 quarts ÷ 3 quarts
13. 144 gallons ÷ 2 gallons
14. 428 pints ÷ 2 pints

15. 24¢ ÷ 3 means that we are to find *one third* of 24¢; thus: $\frac{1}{3}$ of 24¢ equals 8¢, or $3\overline{)24¢}$.
8¢

Find quotients:

16. 224 days ÷ 2
17. 333 cents ÷ 3
18. 216 dollars ÷ 3
19. 622 birds ÷ 2
20. 326 inches ÷ 2
21. 219 hours ÷ 3
22. 444 roses ÷ 2
23. 468 minutes ÷ 2
24. 844 gallons ÷ 2
25. 646 quarts ÷ 2
26. 969 pencils ÷ 3
27. 842 books ÷ 2
28. 936 hours ÷ 3
29. 288 pages ÷ 2
30. 428 pints ÷ 2
31. 639 pens ÷ 3

REMAINDER IN DIVISION

1. Divide 263 by 3.

Divisor 3)263 Dividend
87 Quotient
Remainder 2

26 tens ÷ 3 = 8 tens, and 2 tens (20 ones) remaining. Write the 8 tens in the tens' place. 20 ones + 3 ones = 23 ones. 23 ones ÷ 3 = 7 ones, and 2 ones remaining. Quotient 87; remainder 2.

We think: "3 in 26, 8 times, and 2 remaining; 3 in 23, 7 times, and 2 remaining." Quotient 87; remainder 2.

Test. — If the answer is correct, then 3 × 87, or 261, + 2, the remainder, will equal 263, the dividend.

Divide and test by 2; by 3:

	a	*b*	*c*	*d*	*e*
2.	265	864	786	624	7368
3.	713	219	265	758	2457

4. Compare 12 ÷ 2 and $\frac{1}{2}$ of 12; 12 ÷ 3 and $\frac{1}{3}$ of 12.

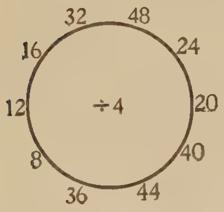
To find $\frac{1}{2}$ *of any number, divide the number by* 2.
To find $\frac{1}{3}$ *of any number, divide the number by* 3.

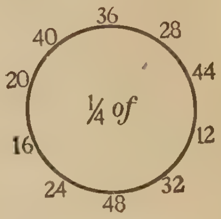
How many are:

	a	*b*	*c*
5.	$\frac{1}{3}$ of 240 men?	$\frac{1}{3}$ of 171 balls?	$\frac{1}{2}$ of $7484?
6.	$\frac{1}{3}$ of 717 feet?	$\frac{1}{2}$ of 216 mi.?	$\frac{1}{3}$ of $3927?
7.	$\frac{1}{3}$ of 435 yd.?	$\frac{1}{3}$ of 384 bu.?	$\frac{1}{2}$ of $8064?
8.	$\frac{1}{3}$ of 759 gal.?	$\frac{1}{2}$ of 902 in.?	$\frac{1}{3}$ of $2160?
9.	$\frac{1}{3}$ of 285 pk.?	$\frac{1}{3}$ of 405 ft.?	$\frac{1}{2}$ of $2754?

DIVIDING BY 4

1. How many are four 2's? 4 in 8, —— times.
2. How many are four 3's? 4 in 12, —— times.
3. How many times does 16 contain 4?
4. 20 contains 4, —— times; 24 contains 4, —— times; 28 contains 4, —— times; 32 contains 4, —— times.
5. 36 ÷ 4 = ? 40 ÷ 4 = ? 44 ÷ 4 = ? 48 ÷ 4 = ?





6. Give quotients.

7. Give parts.

Divide, and test by multiplication:

	a	b	c	d	e
8.	4)268	4)864	4)936	4)468	4)2240
9.	4)3604	4)9216	4)3704	4)4008	4)3246
10.	4)4693	4)5248	4)9270	4)7354	4)4687
11.	4)5169	4)2834	4)6573	4)6291	4)8473
12.	4)6981	4)1243	4)6476	4)5034	4)2075
13.	4)3204	4)4126	4)3958	4)2976	4)8169

DIVISION

1. Walter had 48 baskets of fruit. He sold an equal number to 4 different buyers. How many baskets did each buy?

4)48 No. of baskets. $\frac{1}{4}$ of 48 baskets = 12 baskets.
12 No. of baskets to each.

2. Mary has 45 cents. How many 3 cent oranges can she buy with her money?

3¢ = cost of 1 orange 3¢)45¢
15 times, or 15 oranges.

3. A man divided property valued at $369 equally among his 3 children. How much did each receive?

4. Mr. Bell earned $396 in 3 months. What were his monthly wages?

5. Find the cost of 1 bushel of wheat, if 4 bushels cost 280 cents.

6. If a girl sews 4 buttons on each pair of gloves, how many pairs has she finished when she has used 468 buttons?

7. A farmer having 96 hogs sold one third of them. How many did he sell?

8. In a car containing 639 baskets of peaches, one third were spoiled. How many baskets were spoiled?

9. How many pound boxes can be filled from 164 quarter pounds of candy?

10. When molding costs 15¢ a yard, how much will 1 foot of it cost?

1 ft. = $\frac{1}{3}$ of a yard; 1 ft. will cost $\frac{1}{3}$ of 15¢, or 5 cents.

UNITED STATES MONEY

United States money is written in **dollars** and **cents.**

A period (.), named a "**decimal point,**" is placed to the right of dollars. After the point, cents are written in two places. Thus, 5 dollars and 25 cents is written $5.25.

1. Read: $8.40; $9.67; $3.14; $8.24; $7.05.

In addition and subtraction of United States money, *the point* must be written *under the point,* dollars under dollars, and cents under cents.

Read and add:

2.	$3.45	$2.24	$3.14	$3.62	$2.43
	2.61	3.36	1.35	2.45	3.25

Add across and in columns:

3. $2.24 + $3.25 + $6.42 + $2.56 + $3.25 + $4.63 =

4. $3.14 + $2.35 + $3.11 + $6.14 + $2.65 + $6.15 =

5. $4.24 + $5.32 + $2.34 + $5.23 + $2.34 + $5.26 =

Read and find differences:

	a	*b*	*c*	*d*	*e*
6.	$3.46	$3.25	$3.41	$6.11	$5.13
	1.25	2.74	2.56	2.65	2.65
7.	$2.43	$3.25	$3.41	$6.11	$5.13
	1.47	1.46	2.16	5.26	2.56

8. Add $4.25 and $2.64.

9. Add $3.62 and $2.16.

10. Add $2.54 and $1.36.

11. Add $3.26 and $1.56.

UNITED STATES MONEY

Read and add:

	a	*b*	*c*	*d*
1.	$ 246.25	$ 632.75	$ 327.56	$ 805.96
	318.75	738.49	928.89	613.73
	92.48	918.86	738.86	928.45
	18.64	29.94	198.37	56.91
	237.75	169.83	75.59	219.87
2.	$ 178.84	$ 219.35	$ 165.27	$ 214.56
	6.92	7.29	86.15	3.94
	175.49	216.87	283.85	69.47
	862.81	938.75	395.94	138.85
	219.97	139.49	415.86	475.27

3. $ 465.75 + $ 37.28 + $ 692.37 + $ 475.84 = ?

4. $ 193.85 + $ 87.96 + $ 375.84 + $ 215.79 = ?

5. $ 276.49 + $ 29.49 + $ 49.86 + $ 936.93 = ?

6. $ 475.98 + $ 18.07 + $ 126.92 + $ 214.85 = ?

______ + ______ + ______ + ______ = ?

Subtract and test:

	a	*b*	*c*	*d*
7.	$ 475.36	$ 435.24	$ 438.64	$ 821.42
	196.28	178.95	195.73	195.38
8.	$ 317.61	$ 124.15	$ 326.47	$ 412.49
	219.84	95.76	158.96	273.89

9. $ 246.37 – $ 174.75

10. $ 235.55 – $ 169.73

MULTIPLYING BY 5

1. Count by 5's to 10; to 30; to 45; to 60.

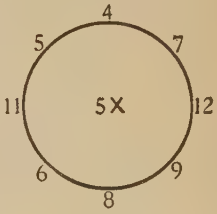
2. How much are two 5-cent pieces? $2 \times 5 = ?$

3. How much are three 5-cent pieces? $3 \times 5 = ?$

4. Tell the value of four 5-cent pieces; of 5 such pieces; of 6, 7, 8, 9, 10, 11, 12.

5. How many 5's are there in 10? in 20? in 30? 60? 25? 35? 45? 55? 40? 50? 15?

6. Multiply each of the outside numbers by 5. Change the number within the circle to 4 and multiply; then to 3; to 2. Build the table of 5's as you built the table of 4's.



7. Memorize the table.

8. Supply the missing numbers:

$2 \times 5 = ?$ 5 is ? of 10
$4 \times ? = 20$? is $\frac{1}{5}$ of 20
$5 \times 5 = ?$ 25 is $? \times 5$
$? \times 5 = 35$? is $\frac{1}{5}$ of 35
$9 \times ? = 45$ $\frac{1}{5}$ of 45 is ?

Table of 5's

$1 \times 5 = 5$	$7 \times 5 = 35$
$2 \times 5 = 10$	$8 \times 5 = 40$
$3 \times 5 = 15$	$9 \times 5 = 45$
$4 \times 5 = 20$	$10 \times 5 = 50$
$5 \times 5 = 25$	$11 \times 5 = 55$
$6 \times 5 = 30$	$12 \times 5 = 60$

9. Give products: 8×5; 9×5; 3×5; 5×5; 7×5; 6×5; 12×5.

10. What is the difference in value between:

3 × \$5 and 5 × \$3? 7 × 5 hats and 5 × 7 hats?
6 × \$5 and 5 × \$6? 2 × 4 books and 4 × 2 books?

MULTIPLICATION OF DOLLARS AND CENTS

1. Multiply $3.65 by 3.

$$\begin{array}{r} \$\,3.65 \\ 3 \\ \hline \$\,10.95 \end{array}$$

In multiplying dollars and cents, place the decimal point in the product directly under the decimal point in the multiplicand. Write the dollar sign before the number of dollars.

2. Multiply $0.65 by 4.

$$\begin{array}{r} \$\,0.65 \\ 4 \\ \hline \$\,2.60 \end{array}$$

3. Multiply 70¢ by 3.

$$\begin{array}{l} 70¢ \\ 3 \\ \hline 210¢ = \$\,2.10 \text{ (Why?)} \end{array}$$

Multiply:

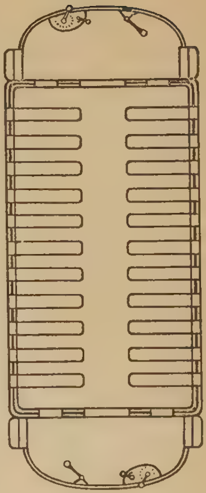
	a	*b*	*c*	*d*
4.	$3.50 2	$3.05 4	$6.05 3	$9.40 5
5.	$7.04 4	$0.60 5	$0.08 3	74¢ 4
6.	22¢ 3	49¢ 5	26¢ 4	95¢ 5

7. How much will 3 pecks of peaches cost at 65¢ a peck?

8. A messenger boy delivers 4 messages at 45¢ each. How much does he earn for his company?

9. May gets $3.75 per week in a department store. Find her wages for 4 weeks.

PRACTICAL PROBLEMS



1. How many seats are there on each side of the car?

2. How many are two times 11 seats?

3. The conductor collected 75 fares on the first trip and 87 fares on the return trip. How many fares did he collect?

4. The fare is 5 cents. How much money did he collect on both trips?

5. A lady paid for herself and 5 children. She gave the conductor a half dollar. How much change should she receive?

6. Each seat will accommodate two persons. How many persons can be seated in the car?

7. The conductor earns $2.50 in a day. How much does he earn in 5 days?

8. The motorman is paid $2.75 a day. How much does he earn in 5 days? How much more does he earn in a day than the conductor?

9. The line is 8 miles long. How far does a car run in making 5 round trips?

10. On one trip each seat was occupied, and 5 persons had to stand. Find the amount of the fares for the trip.

MULTIPLYING BY 6

1. Count by 6's to 12; to 24; to 48; to 60; to 72. Build the table of 6's.

2. How many 6's are there in 12? in 18? 24? 36? 48? 54? 60? 66? 72?

Table of 6's

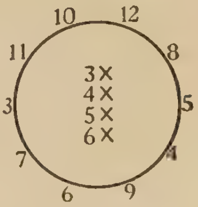
1 × 6 = 6	7 × 6 = 42
2 × 6 = 12	8 × 6 = 48
3 × 6 = 18	9 × 6 = 54
4 × 6 = 24	10 × 6 = 60
5 × 6 = 30	11 × 6 = 66
6 × 6 = 36	12 × 6 = 72

3. Memorize the table.

4. Compare in two ways: Thus 6 is 3 more than 3; 6 is 2 × 3.

6 and 3	12 and 3
6 and 4	12 and 4
6 and 5	12 and 5
4 and 2	16 and 4

5. Multiply each number outside the circle first by 3, then by 4, then by 5, then by 6.



Multiply by 6; by 5; by 4; by 3:

	a	*b*	*c*	*d*	*e*
6.	243	567	149	759	894
7.	679	295	293	384	679
8.	978	869	687	825	856
9.	207	890	903	708	605

10. Give products at sight:

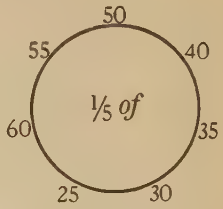
6 × 40	5 × 20	6 × 80	5 × 50	6 × 61
6 × 70	5 × 35	5 × 32	6 × 25	6 × 42
6 × 90	5 × 41	4 × 71	4 × 92	6 × 81

DIVIDING BY 5

1. Count by 5's to 15; to 25; to 45; to 50; to 60.

2. ? × 5 = 15   ? × 5 = 20   ? × 5 = 40

3. Give answers:



5 ÷ 5   15 ÷ 5   50 ÷ 5   45 ÷ 5
30 ÷ 5   40 ÷ 5   35 ÷ 5   10 ÷ 5
55 ÷ 5   60 ÷ 5   25 ÷ 5   20 ÷ 5

Division may be indicated in *three ways:* First, 8 ÷ 2; second, 2)8; third, $\frac{8}{2}$. Each is read 8 *divided by* 2.

4. Read and solve:

16 ÷ 4   4)16 $\frac{16}{4}$ $\frac{25}{5}$ $\frac{64}{4}$ $\frac{36}{3}$ $\frac{52}{4}$
$\frac{39}{3}$ $\frac{55}{5}$ $\frac{125}{5}$ $\frac{324}{4}$ $\frac{340}{5}$ $\frac{284}{4}$ $\frac{345}{5}$

5. Divide by 5 and give remainders:

43   62   27   48   39   56   53   14   27

6. Find $\frac{1}{5}$ of:

420 men   375 hr.   825 pt. $ 415   870¢
365 horses   180 da.   315 gal. $ 630   560¢

Divide and test:

	a	*b*	*c*	*d*	*e*
7.	5)4225	5)7086	5)9275	5)4376	5)8450
8.	5)5693	5)4287	5)1364	5)7006	5)7005
9.	5)7024	5)9046	4)2753	5)4203	5)2004

DIVIDING BY 6

1. How many times is 6 contained in 12? in 18? in 24? in 48? 60? 54? 36? 66? 42? 72?

2. Give answers:

$42 \div 6$ $60 \div 6$ $36 \div 6$ $24 \div 6$ $48 \div 6$

$35 \div 5$ $48 \div 4$ $\frac{1}{5}$ of 35 $\frac{1}{6}$ of 42 $60 \div 6$

$6\overline{)48}$ $6\overline{)60}$ $6\overline{)54}$ $6\overline{)36}$ $6\overline{)30}$

3. Divide each number by 6:

480 600 624 540 366

720 618 246 726 612

4. Complete:

$15 \div 6 =$ — and — over. $6 \times 8, + ? = 50$ $6 \times 9, + ? = 59$

$45 \div 6 =$ — and — over. $? \times 6, + 2 = 56$ $6 \times ?, + 3 = 45$

5. Divide by 5 and give remainders; then by 6:

843 864 631 7235 8697

675 293 845 4618 3256

931 787 569 8627 4367

6. Compare in two ways: \$18 and \$3; \$36 and \$6; 35 books and 5 books; 24 hats and 4 hats; 42 lemons and 7 lemons; 45¢ and 5¢.

7. Find the cost of:

6 oranges at 18¢ a doz. 40 pears at 4¢ each.

36 apples at 2¢ each. 18 eggs at 10¢ a doz.

8. At 3¢ apiece, how many oranges can you buy for 18¢? for 42¢? for 36¢? for 72¢?

PRACTICAL PROBLEMS

1. Find the cost of 5 yards of cloth at $.75 a yard.

2. Four boys deposited in the school bank as follows: $4.25, $6.93, $4.34, and $6.05. What was the entire deposit?

3. Julia went to the store with a twenty-dollar bill. She paid 75 cents a yard for 6 yards of oilcloth, and $9.50 for a rug. How much had she left?

4. A box contains 360 oranges. If $\frac{1}{6}$ of them are bad, how many good ones are there in the box?

5. At 36 cents a dozen, how much will 5 dozen oranges cost?

6. At 24 cents a dozen, how much will 6 dozen oranges cost? How much change should a lady receive after paying for the oranges with a two-dollar bill?

7. Make a problem with: $8.25, $6.32, $6.56, and $5.

8. John paid a bill of $7.32 and had $6.54 remaining. How much had he at first?

9. If there are 28 lines on each page of a book, how many lines are there on 6 pages?

10. A furniture dealer paid $624 for tables at $6 each. How many did he buy?

11. Jack has collected 250 post cards and pastes 5 on each page of his album. How many pages do they fill?

12. How many lamps, at $5 each, can be bought for $83? How much money will remain?

DRILLS IN ADDITION

Add rapidly, finding 3 answers in 1 minute.

	a	*b*	*c*	*d*	*e*
1.	2345	3256	3556	4325	2546
	3253	5433	5234	2534	3452
	1432	2345	3245	3523	2543
	2564	4356	5243	2456	3245
	7316	5134	2356	5346	1236
2.	2434	3245	2546	6513	5342
	3256	1452	4532	3245	4254
	5145	5416	3251	5314	6143
	4253	2533	5424	2425	3325
	3242	3254	1243	5253	2543
3.	6325	6436	6323	6546	6546
	4264	2462	2566	3562	4362
	2633	6354	6344	6255	6543
	1462	5633	2565	5364	2544
	6326	3265	6355	4534	6355

4. Give sums at sight, thus: 32 + 40 = 72; 72 + 5 = 77.

32 + 45
64 + 36
56 + 45
64 + 35
38 + 17
29 + 16
19 + 28

55 + 34
56 + 56
64 + 46
36 + 25
37 + 26
25 + 47
49 + 26

54 + 32
23 + 34
42 + 32
26 + 43
59 + 17
57 + 24
39 + 58

26 + 34
42 + 64
36 + 25
53 + 36
35 + 45
66 + 26
47 + 47

43 + 44
25 + 56
66 + 36
54 + 26
25 + 28
38 + 26
29 + 25

SUBTRACTION

From 804 take 365.

1.

$$\begin{array}{ccc} {\scriptstyle 7} & {\scriptstyle 9} & {\scriptstyle 14} \\ 8 & 0 & 4 \\ \underline{3} & \underline{6} & \underline{5} \\ 4 & 3 & 9 \end{array}$$

We cannot take 5 ones from 4 ones.

We cannot take 6 tens from 0 tens.

Take 1 hundred from 8 hundreds; this leaves 7 hundreds. 1 hundred equals 10 tens. Take 1 ten from 10 tens, leaving 9 tens. 1 ten and 4 ones are 14 ones. 804 therefore is equal to 7 hundreds, 9 tens, and 14 ones. Subtracting, the difference is 439.

Subtract:

	a	*b*	*c*	*d*	*e*
2.	6304 3168	7065 1474	6401 3162	8014 6202	4706 2165
3.	4060 2976	8305 6012	8560 3574	6070 4304	4904 1060
4.	6105 2166	7805 4991	6099 4814	3940 2108	6303 1494
5.	8110 4884	4444 2666	6222 4879	8314 6070	8196 7246
6.	6162 3104	3110 2904	5641 3212	4132 1841	6112 3897

7. Find the difference between 8904 and 1996; between 9630 and 2709.

DRILLS IN SUBTRACTION

Subtract, finding 5 remainders in 1 minute:

	a	*b*	*c*	*d*	*e*
1.	5434 3565	3254 2435	4203 1564	6043 2564	2015 1356
2.	4360 2654	3204 1605	3204 1316	2010 1516	3014 2546
3.	3105 1046	4010 2505	6302 2603	3051 2103	6031 5076
4.	6035 2456	6501 2436	1045 556	3060 2065	4320 1556
5.	1405 656	2601 1654	3561 1456	6306 2501	5041 1305
6.	6702 3026	2041 1554	6020 1615	5031 1025	6043 1245
7.	6103 2005	3014 2245	2031 1505	6072 4003	5102 3248
8.	5203 1546	6203 5204	4106 3502	2435 1543	5210 1435

DRILLS IN MULTIPLICATION AND DIVISION

Multiply and divide each number by 2, 3, 4, and 5:

	a	b	c	d	e	f
1.	468	456	273	332	634	804
2.	684	654	372	233	436	972
3.	236	564	732	548	364	729
4.	632	542	412	485	184	908
5.	846	452	214	854	418	890

Multiply and divide each number by 6, 5, 4, and 3:

6.	426	848	408	798	249	284
7.	264	844	840	897	942	428
8.	624	853	480	789	429	842
9.	165	790	981	679	257	912
10.	561	970	189	796	725	192

Multiply and divide each number by 2, 4, 6, and 5:

11.	456	295	217	513	665	537
12.	654	925	172	135	656	357
13.	546	529	918	150	250	640
14.	237	592	189	510	520	460
15.	372	712	891	566	502	604

Multiply and divide each number by 3, 5, 6, and 4:

16.	206	666	270	474	228	924
17.	620	246	720	276	282	492
18.	457	426	372	822	249	742
19.	475	642	723	726	846	952

DRY MEASURES

1. Name some dry articles purchased by the pint; by the quart; the peck; the bushel.

2. Secure some sand or grain, and show by actual measurements the number of pints in a quart; the number of quarts in a peck; the number of pecks in a bushel.

3. Memorize this table:

2 pints = 1 quart; written, 2 pt. = 1 qt.
8 quarts = 1 peck; written, 8 qt. = 1 pk.
4 pecks = 1 bushel; written, 4 pk. = 1 bu.

4. 1 bu. = —— pecks; 1 pk. = —— quarts.

5. How many quarts equal 1 bushel?

6. $\frac{1}{4}$ pk. = —— quarts; $\frac{1}{2}$ pk. = —— quarts.

7. At 10¢ per quart, find the cost of 8 quarts of cherries.

8. At 6¢ per quart, find the cost of 1 peck of hazelnuts.

9. A horse eats 12 quarts of oats a day. How many quarts does it eat in 4 days?

10. $2\frac{1}{2}$ pk. = —— quarts; 16 qt. = —— pecks.

11. James bought $1\frac{1}{2}$ bushels of tomatoes. How many pecks did he buy?

12. If I buy $\frac{1}{2}$ peck of cherries, how many quarts should I get?

LIQUID MEASURES

1. Name some liquids sold by the pint; by the quart; the gallon.

2. Memorize this table:

2 pints = 1 quart; written, 2 pt. = 1 qt.
4 quarts = 1 gallon; written, 4 qt. = 1 gal.

3. 2 gallons = how many quarts?

4. From a gallon of milk how many quarts could be sold? how many pints?

5. Mrs. Adams buys 2 quarts of milk per day. How many quarts does she buy in 20 days? how many gallons?

6. At 6¢ per quart, how much does the milk cost her per week?

7. From a cask containing 3 gallons of vinegar, how many quarts could be sold?

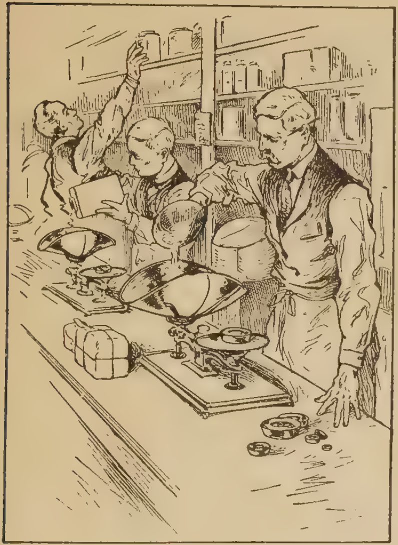
8. How many pints are there in 12 quarts? how many gallons?

Copy these problems and insert the answers in the blank spaces:

9. 1 qt. = —— pt.
10. 8 qt. = —— gal.
11. 16 pt. = —— qt.
12. 8 gal. = —— pt.
13. 8 pt. = —— qt.
14. 4 gal. = —— qt.
15. 24 qt. = —— gal.
16. 6 pt. = —— qt.
17. 4 qt. = —— gal.
18. 5 gal. = —— pt.

MEASURES OF WEIGHT

1. Tell how the following articles are sold:
Butter, eggs, milk, cheese, coal, oil.



2. Give the tables of liquid measures and dry measures.

The smallest weight in the picture is called an **ounce weight.** The largest weight is a sixteen-ounce weight, and is called a **pound weight.**

Any article that the pound weight balances is said to weigh just **one pound.**

16 ounces = 1 pound; written, 16 oz. = 1 lb.

3. A lady's purchase at the store is balanced by the 8 oz. weight. What is the weight of her package?

4. 6 oz. + 4 oz. + 6 oz. = —— lb.

5. 10 oz. + 12 oz. + 10 oz. = —— lb.

6. $\frac{1}{4}$ lb. = —— oz. $\frac{1}{2}$ lb. = —— oz. $\frac{1}{8}$ lb. = —— oz.

7. How many 2 oz. packages weigh 1 pound?

MEASURES OF LENGTH OR DISTANCE

1. Examine a foot rule.

2. Into how many parts do the long marks divide the rule?

3. The distance between any two of these marks is called **one inch.**

4. Count the inches in a foot.

5. Place the rule on a paper or on the blackboard and mark off a line 12 inches long.

6. A line 12 inches long is called **one foot.**

12 inches = 1 foot; written, 12 in. = 1 ft.

7. Short distances are measured in *inches* or *feet.*

8. 6 inches is what part of a foot?

9. Draw a line $\frac{1}{2}$ ft. in length. How many inches long is the line?

10. Draw a line $\frac{1}{3}$ ft. in length. How many inches long is this line?

11. Without the aid of a rule, draw a line 12 inches in length; 6 inches in length; 2 feet in length.

12. Place the rule on the lines in problem 11 and observe how much too long or too short they were drawn.

Pupils should practice this kind of work until they can estimate length quite accurately.

MEASURES OF LENGTH OR DISTANCE

1. Measure the top of your desk in feet and inches.

2. $\frac{1}{4}$ ft. = —— inches; $\frac{1}{3}$ ft. = —— inches.

3. Some articles are sold by a measure 3 times the length of a foot rule. Name some of them.

4. Draw a line on the blackboard 3 feet in length.

5. The line you have drawn is **one yard** long.

3 feet = 1 yard; written, 3 ft. = 1 yd.

6. A piece of cloth is 6 yards long. How many feet is it in length?

Copy and fill in the blanks:

7. 36 in. = —— ft.
8. 3 ft. = —— yd.
9. 2 ft. = —— in.
10. 60 in. = —— ft.
11. 18 ft. = —— yd.
12. 3 ft. = —— in.
13. 4 ft. = —— in.
14. $2\frac{1}{2}$ ft. = —— in.
15. $3\frac{1}{3}$ yd. = —— ft.
16. 15 ft. = —— yd.
17. 7 yd. = —— ft.
18. 6 ft. = —— in.

Change:

19. 2 ft. and 3 in. to inches.
20. 3 ft. and 4 in. to inches.
21. 4 yd. and 1 ft. to feet.
22. 6 yd. and 2 ft. to feet.
23. 27 in. to feet and inches.
24. 16 ft. to yards and feet.
25. 36 in. to yards
26. 12 ft. to yards
27. 24 in. to feet.
28. 48 in. to feet.
29. 36 yd. to feet.
30. $5\frac{1}{3}$ yd. to feet.

READING AND WRITING NUMBERS

In reading large numbers, separate them by commas into groups of *three* figures each, beginning at the right.

Each group is called a **period** and has *ones*' place, *tens*' place, and *hundreds*' place. The last period to the left may contain only one or two figures; as, 8,245; 28,375.

Beginning at the right, the places in 24,205 are called *ones*, *tens*, *hundreds*, *thousands*, *tens of thousands*. The number is read, "24 thousand, 205."

Copy, point off into periods, and read:

	a	*b*	*c*	*d*
1.	45268	65283	25834	31849
2.	39371	94736	93687	40306
3.	20905	18110	60009	37000

ROMAN NUMERALS

1. Write the Roman numerals from 11 to 19. Place X before each. This gives the numerals from 21 to 29.

2. XXX = 30. L = 50. XL = 40.
Write the numerals from 31 to 40; from 41 to 50.

3. LX = 60. LXX = 70. LXXX = 80.
Write the numerals from 50 to 70.

4. C = 100. CC = 200. XC = 90. XCIX = 99
Write the numerals from 70 to 100.
Write 210, 290, 299, 300, 349, 235, 341.
Read XCII, CIX, CCXL, CCXCIX.

ADDITION AND SUBTRACTION OF U. S. MONEY

Read and add:

	a	*b*	*c*	*d*
1.	$286.75	$364.92	$615.94	$961.37
	931.49	19.39	293.29	149.95
	86.72	187.46	89.67	98.69
	73.87	29.84	173.28	83.75
	68.45	382.73	8.75	278.87
2.	$24.35	$15.46	$21.95	$43.74
	13.64	33.71	15.84	17.27
	71.25	16.15	22.65	33.75
	45.32	32.43	16.34	45.45

3. $8692 + $193.75 + $475.86 + $286.37 + $90

4. $187.14 + $275.61 + $630.18 + $5.25 + $0.18

5. $263.35 + $436.75 + $195.19 + $2.75 + $84

Subtract:

	a	*b*	*c*	*d*	*e*
6.	$243.56	$315.46	$254.73	$269.46	$226.42
	186.38	169.75	80.06	178.95	9.70
7.	$486 35	$268.43	$124.39	$923.14	$275.86
	129.76	174.85	86.41	189.67	185.86

Find the difference between:

8. $406.75 and $216.40

9. $325.43 and $ 74.65

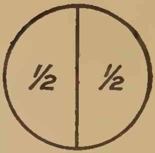
10. $468.36 and $196.09

11. $436.74 and $175.12

12. $263.37 and $144.00

13. $276.10 and $186.19

HALVES



1. Into how many parts has the circle been divided? What is the name of each part? Into how many halves can an object be divided?

2. 1 half apple + 1 half apple = ? $\$\frac{1}{2}+\$\frac{1}{2}=?$

3. 1 half dozen + 1 half dozen = ? $\frac{1}{2}$ yd. + $\frac{1}{2}$ yd. = ?

Find the sum of:

$$\textbf{4. }\begin{array}{l} 1\frac{1}{2}\text{ gal.} \\ \underline{3\text{ gal.}} \end{array} \qquad \textbf{5. }\begin{array}{l} 4\frac{1}{2}\text{ bu.} \\ \underline{2\frac{1}{2}\text{ bu.}} \end{array} \qquad \textbf{6. }\begin{array}{l} 5\frac{1}{2}\text{ yd.} \\ \underline{4\frac{1}{2}\text{ yd.}} \end{array} \qquad \textbf{7. }\begin{array}{r} 3\frac{1}{2}\text{ qt.} \\ \underline{\frac{1}{2}\text{ qt.}} \end{array}$$

8. Add:

$$\begin{array}{r} 15\frac{1}{2} \\ 9\frac{1}{2} \\ 6\frac{1}{2} \\ \hline 31\frac{1}{2} \end{array}$$

$\frac{1}{2}+\frac{1}{2}=1;\ 1+\frac{1}{2}=1\frac{1}{2}.$

Write the fraction $\frac{1}{2}$, and add 1 to the whole numbers.

9. $4\frac{1}{2}+27\frac{1}{2}+3\frac{1}{2}$

10. $9\frac{1}{2}+18\frac{1}{2}+27\frac{1}{2}$

11. $11\frac{1}{2}+25\frac{1}{2}+42\frac{1}{2}$

12. $9\ +37\frac{1}{2}+86\frac{1}{2}$

Insert the missing number:

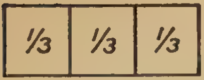
$$\textbf{13.}\quad \begin{array}{r} 4\frac{1}{2} \\ +\qquad \\ \hline 10\frac{1}{2} \end{array} \quad \begin{array}{r} 7\frac{1}{2} \\ +\qquad \\ \hline 15\frac{1}{2} \end{array} \quad \begin{array}{r} 6\frac{1}{2} \\ +\qquad \\ \hline 7\frac{1}{2} \end{array} \quad \begin{array}{r} 8\frac{1}{2} \\ +\qquad \\ \hline 12\frac{1}{2} \end{array} \quad \begin{array}{r} 9\frac{1}{2} \\ +\qquad \\ \hline 18\frac{1}{2} \end{array} \quad \begin{array}{r} 11 \\ +\qquad \\ \hline 20\frac{1}{2} \end{array}$$

Subtract:

$$\textbf{14.}\quad \begin{array}{r} 8\frac{1}{2} \\ -5\phantom{\frac{1}{2}} \\ \hline \end{array} \quad \begin{array}{r} 4\frac{1}{2} \\ -3\phantom{\frac{1}{2}} \\ \hline \end{array} \quad \begin{array}{r} 12\frac{1}{2} \\ -10\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 11\frac{1}{2} \\ -\ 9\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 14\frac{1}{2} \\ -\ 7\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 16\frac{1}{2} \\ -\ 8\frac{1}{2} \\ \hline \end{array}$$

$$\textbf{15.}\quad \begin{array}{r} 24\frac{1}{2} \\ -\ 7\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 17\frac{1}{2} \\ -\ 9\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 25\frac{1}{2} \\ -18\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 38\frac{1}{2} \\ -25\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 62\frac{1}{2} \\ -37\phantom{\frac{1}{2}} \\ \hline \end{array} \quad \begin{array}{r} 49\frac{1}{2} \\ -26\frac{1}{2} \\ \hline \end{array}$$

THIRDS



1. How many thirds are there in the oblong? How many thirds are there in one of anything? in 1 yard? How many feet are there in 1 yard? What part of a yard is 1 foot? What part of a yard is 12 inches? How many thirds are there in 2 oranges?

Add:

2. $\frac{1}{3}+\frac{1}{3}=\frac{?}{3}$ $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}=\frac{3}{3}$, or 1 $\frac{2}{3}+\frac{2}{3}+\frac{2}{3}=\frac{6}{3}$, or 2

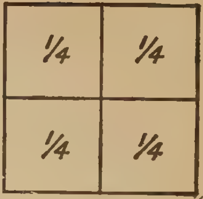
	a	*b*	*c*	*d*	*e*
3.	$4\frac{1}{3}$ $+2\frac{2}{3}$	$6\frac{2}{3}$ $+1\frac{1}{3}$	$5\frac{1}{3}$ $+4$	$8\frac{1}{3}$ $+5\frac{1}{3}$	$9\frac{1}{3}$ $+7\frac{2}{3}$
4.	$8\frac{1}{3}$ $10\frac{1}{3}$ $12\frac{1}{3}$	$7\frac{2}{3}$ $6\frac{2}{3}$ $8\frac{2}{3}$	$9\frac{1}{3}$ 5 $8\frac{2}{3}$	7 $8\frac{2}{3}$ $6\frac{1}{3}$	12 $8\frac{1}{3}$ $9\frac{2}{3}$

Find the missing number:

5.	$8\frac{2}{3}$ $+$ $11\frac{2}{3}$	$9\frac{1}{3}$ $+$ $14\frac{2}{3}$	7 $+$ $12\frac{2}{3}$	$15\frac{1}{3}$ $+$ $18\frac{2}{3}$	$8\frac{2}{3}$ $+$ $11\frac{2}{3}$
6.	$7\frac{2}{3}$ -3	$8\frac{2}{3}$ $-5\frac{1}{3}$	$9\frac{2}{3}$ $-4\frac{2}{3}$	$18\frac{2}{3}$ $-5\frac{2}{3}$	$17\frac{2}{3}$ $-9\frac{2}{3}$

7. I rubbed out $2\frac{2}{3}$ inches from a line $5\frac{2}{3}$ inches long. How long was the part remaining?

FOURTHS



1. Into how many parts has the square been divided? Give the name of each part. What is the difference between a quarter and a fourth of $ 1? of 1 pie? of 1 apple? Into how many fourths can any object be divided?

$\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=$ how many fourths? $\frac{3}{4}$ gal. + $\frac{1}{4}$ gal. = ?

Find the sum:

2. $ $2\frac{1}{4}$ + $ $\frac{3}{4}$
3. $6\frac{1}{4}+\frac{1}{4}$
4. $6\frac{1}{4}$ gal. + $\frac{3}{4}$ gal.
5. $3\frac{1}{4}$ pk. + $2\frac{2}{4}$ pk.
6. $8\frac{1}{4}$ bu. + $\frac{3}{4}$ bu.
7. $7\frac{3}{4}$ hr. + $1\frac{1}{4}$ hr.

Add:

	a	*b*	*c*	*d*	*e*	*f*
8.	$2\frac{1}{4}$	$6\frac{2}{4}$	$5\frac{1}{4}$	$3\frac{1}{4}$	$10\frac{2}{4}$	$12\frac{1}{4}$
	$3\frac{2}{4}$	$7\frac{3}{4}$	$6\frac{1}{4}$	$8\frac{1}{4}$	$7\frac{3}{4}$	9
	$5\frac{1}{4}$	$8\frac{3}{4}$	$25\frac{1}{4}$	$9\frac{1}{4}$	$8\frac{3}{4}$	$8\frac{3}{4}$
9.	11	$18\frac{3}{4}$	$19\frac{1}{4}$	$\frac{3}{4}$	$5\frac{1}{4}$	$20\frac{1}{4}$
	$14\frac{1}{4}$	$16\frac{2}{4}$	8	$\frac{3}{4}$	$6\frac{3}{4}$	8
	$27\frac{1}{4}$	$21\frac{3}{4}$	$62\frac{3}{4}$	$\frac{2}{4}$	17	$31\frac{3}{4}$

Complete:

10. $4\frac{1}{4}+?=9\frac{3}{4}$
11. $6\frac{3}{4}+?=8\frac{3}{4}$
12. $6\frac{1}{4}+?=11\frac{1}{4}$
13. $9\frac{3}{4}+?=13\frac{3}{4}$
14. $?+8\frac{1}{4}=15\frac{1}{4}$
15. $?+\frac{1}{4}=6\frac{2}{4}$

Find the difference:

16. $8\frac{1}{4}-7$
17. $16\frac{3}{4}-5\frac{1}{4}$
18. $23\frac{3}{4}-7\frac{3}{4}$
19. $9\frac{3}{4}-8\frac{1}{4}$
20. $16\frac{1}{4}-7\frac{1}{4}$
21. $12\frac{2}{4}-11\frac{2}{4}$
22. $19\frac{3}{4}-7\frac{1}{4}$
23. $16\frac{1}{4}-8$
24. $14\frac{1}{2}-7$

PRACTICAL PROBLEMS

1. A dealer sold $2\frac{1}{4}$ tons of coal at one time and $3\frac{3}{4}$ tons at another time. How many tons did he sell?

2. From a barrel containing $31\frac{1}{2}$ gallons, 25 gallons were sold. How many gallons remained?

3. A dairyman sold in one month $1875\frac{1}{2}$ gallons of milk. He sold 250 gallons less the next month. How much did he sell the second month?

4. A farmer picked potatoes as follows: 23 bu., $24\frac{1}{2}$ bu., and $11\frac{1}{2}$ bu. How many bushels did he pick?

5. After selling $56\frac{1}{2}$ bu. of the potatoes, how many bushels remained?

6. $7\frac{2}{3}$ yards of silk were cut from a piece containing $18\frac{2}{3}$ yards. How many yards remained?

7. A dressmaker used $5\frac{1}{2}$ yards of cloth for a skirt and $2\frac{1}{2}$ yards for a waist. How many yards did she use for both?

8. Mr. Miller owned $30\frac{1}{2}$ acres of land. He kept $24\frac{1}{2}$ acres and sold the remainder at $48 an acre. How much did he receive for the part sold?

9. Find the weight of 4 baskets of butter containing $35\frac{1}{2}$ lb., 18 lb., $22\frac{1}{2}$ lb., and 16 lb., respectively.

10. Harry made $8\frac{1}{2}$ gallons of lemonade and sold 7 gallons. How much was unsold?

11. Find the distance around a room that is $18\frac{1}{2}$ ft. long and 16 ft. wide.

REVIEW

1. Count by 5's from 0 to 100.

2. Count by 6's from 0 to 120.

The sign @ followed by a price means "at" so much a unit. Thus, "3 lb. steak @ 15¢" means "3 lb. steak *at* 15¢ *a pound;*" "6 doz. buttons @ 20¢" means "6 doz. buttons *at* 20¢ *a dozen.*"

Find the amount of each of the following:

3. 3 lb. steak @ 15¢.
4. 6 bu. potatoes @ 48¢.
5. 6 lb. sugar @ 4¢.
6. 5 cans tomatoes @ 12¢.
7. 6 doz. eggs @ 22¢.

Find the cost of:

8. 5 sheep @ $4.75.
9. 6 bureaus @ $7.75.
10. 6 cows @ $48.
11. 6 rugs @ $4.75.
12. 5 vases @ $2.65.
13. 6 hats @ $1.25.
14. 5 books @ $1.75.
15. 6 lamps @ $1.33.
16. 6 wagons @ $85.
17. 5 horses @ $175.

18. Add 45 and 56, thus: 45 and 50 are 95; 95 and 6 are 101.

Add in the same way:

19. 35 and 48
20. 18 and 25
21. 20 and 46
22. 81 and 72
23. 78 and 64
24. 84 and 76
25. 93 and 42
26. 48 and 75
27. 19 and 96
28. 78 and 97
29. 87 and 46
30. 96 and 41

MULTIPLYING BY 7

1. Count by 7's to 21; to 42; to 63; to 84.

2. 2 × 7 = ? 3 × 7 = ? etc., to 12 × 7 = ?

3. Build the table of 7's.

4. Compare in value 5 × 7 and 7 × 5; 3 × 7 and 7 × 3; 7 × 6 and 6 × 7; 7 × 2 and 2 × 7; 4 × 7 and 7 × 4.

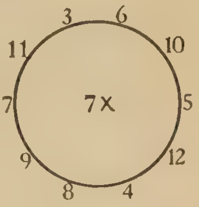


Table of 7's

1 × 7 = 7
2 × 7 = 14
3 × 7 = 21
4 × 7 = 28
5 × 7 = 35
6 × 7 = 42
7 × 7 = 49
8 × 7 = 56
9 × 7 = 63
10 × 7 = 70
11 × 7 = 77
12 × 7 = 84

5. Memorize the table.

6. What multiplicand and multiplier make:

49	12	36	28	24
35	30	14	18	14
25	42	20	27	21
63	84	77	72	54

	a	*b*	*c*	*d*	*e*
7.	2456	3265	4157	8963	9045
	× 7	× 7	× 7	× 7	× 7
8.	7739	8497	6198	5424	6339
	× 7	× 7	× 7	× 7	× 7

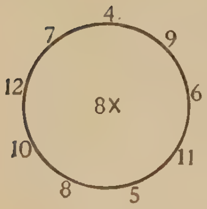
Multiply by 7, testing answers:

9.	4693	7528	6934	8576	7935
10.	7208	5697	2469	3875	8094

MULTIPLYING BY 8

1. Count by 8's to 24; to 64; to 96.

2. How many are 2 × 8 balls? 3 × 8 books? 4 × 8 boys? 5 × 8 pens? 6 × 8 apples?



3. Build the table of 8's.

4. Give quickly:

6 × 8 8 × 6 7 × 8 5 × 8
8 × 4 8 × 10 8 × 2 8 × 11
8 × 12 4 × 8 6 × 8 8 × 5

Table of 8's

1 × 8 = 8	7 × 8 = 56
2 × 8 = 16	8 × 8 = 64
3 × 8 = 24	9 × 8 = 72
4 × 8 = 32	10 × 8 = 80
5 × 8 = 40	11 × 8 = 88
6 × 8 = 48	12 × 8 = 96

5. Memorize the table.

6. Give answers:

? × 8 = 32 7 × ? = 56
6 × ? = 48 ? × 5 = 40
? × 8 = 72 8 × ? = 64
10 × ? = 80 ? × 3 = 27
12 × ? = 96 2 × ? = 18

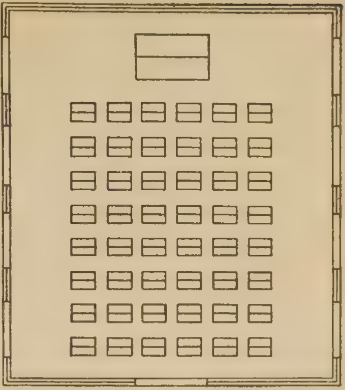
Multiply by 8:

	a	*b*	*c*	*d*	*e*
7.	6230	5178	8629	9310	7865
8.	2937	8694	9083	8697	7289
9.	9048	6937	2865	4705	8136

Give products at sight:

10. 8 × 50 8 × 70 8 × 91 8 × 12 8 × 31
11. 7 × 40 7 × 60 7 × 71 8 × 11 7 × 20
12. 8 × 90 7 × 81 8 × 30 7 × 21 8 × 61

PRACTICAL PROBLEMS



1. This schoolroom is 32 feet long and 28 feet wide. What is the distance around it?

2. The glass in each window cost $2.50. How much was paid for all the glass?

3. Each desk cost $3.25. Find the cost of the desks in each long row.

4. Find the value of the desks in the 6 rows.

5. The attendance for the first 8 school days was as follows: 36, 43, 42, 43, 37, 41, 43, 43, respectively. What was the average attendance?

NOTE. — To find the average add the eight numbers and divide the sum by 8.

6. Eight tons of coal were used during the term. How much was paid for the coal at $4.50 a ton?

7. What is the amount of the teacher's salary for 8 months, at $50 a month?

8. Find the entire cost of:

8 Advanced Geographies at $1.00 each.
8 Primary Geographies at $.45 each.
8 Grammars at $.50 each.
8 Language Lessons at $.35 each.
8 Readers at $.48 each.

DIVIDING BY 7

1. How many times is 7 contained in 14? in 21? 42? 63? 28? 35? 49? 70? 77? 56?

2. Find $\frac{1}{7}$ of 84; 63; 42; 35; 56; 70; 14; 21.

Divide:

	a	*b*	*c*	*d*	*e*	*f*
3.	7)42	7)63	7)56	7)49	7)84	7)35
4.	6)72	5)45	6)42	7)28	6)48	7)70

Divide by 7:

5.	84	56	59	68	45	36
6.	217	364	427	637	273	696

Divide and test:

	a	*b*	*c*	*d*	*e*
7.	7)2436	6)7391	7)8693	6)7857	7)4693
8.	5)2609	7)8054	6)3079	7)2096	5)8097
9.	7)7381	6)2867	7)2536	5)3204	7)6973

10. How many 7-pound boxes can be filled from 259 pounds of barley?

11. How many weeks are there in 49 days?

12. How many suits, each requiring 7 yards, can be made from a piece of cloth containing 84 yards?

13. How many 7¢ packages of crackers can be bought for $1, and how much money will be left?

DIVIDING BY 8

1. $48 - 8 - 8 - 8 - 8 - 8 = ?$ $48 \div 6 = ?$

2. $2 \times 8 = ?$ $16 \div 2 = ?$ $8 \times 3 = ?$ $24 \div 8 = ?$ $8 \times 4 = ?$

3. $32 \div 8 = ?$ $40 \div 5 = ?$ $56 \div 8 = ?$ $64 \div 8 = ?$ $72 \div 8 = ?$

4. 64 contains 8, —— times 72 contains 8, —— times
56 contains 8, —— times 48 contains 8, —— times
96 contains 8, —— times 88 contains 8, —— times

Give quotients:

	a	*b*	*c*	*d*	*e*
5.	8)64	8)32	8)40	8)72	8)56
6.	8)16	7)56	8)24	7)63	8)48
7.	7)35	8)88	7)28	8)96	8)80

Find:

8. $\frac{1}{8}$ of 72 $\frac{1}{8}$ of 64 $\frac{1}{8}$ of 32 $\frac{1}{8}$ of 56 $\frac{1}{8}$ of 48

9. $\frac{1}{8}$ of 640 $\frac{1}{8}$ of 720 $\frac{1}{8}$ of 400 $\frac{1}{8}$ of 320 $\frac{1}{8}$ of 800

Divide by 8:

10. 175 823 629 473 621

11. 8073 2096 3075 4083 6029

12. 2903 8107 2904 7908 8604

13. 6195 2936 8629 4175 2936

14. How many tablets at 8¢ each can be bought for $1, and how many cents will be left?

15. A furniture dealer paid $240 for ice chests at $8 each. How many chests did he purchase?

MULTIPLICATION BY MIXED NUMBERS

A **mixed number** is composed of an integer and a fraction.

1. Multiply 16 by $2\frac{1}{2}$.

$$\begin{array}{rr} & 16 \\ & \underline{2\frac{1}{2}} \\ \frac{1}{2} \text{ of } 16 = & 8 \\ \underline{2} \times 16 = & \underline{32} \\ 2\frac{1}{2} \times 16 = & 40 \end{array}$$

$2\frac{1}{2}$ times 16 means that $\frac{1}{2}$ of 16 is to be added to 2 times 16.

Short Form

$$\begin{array}{r} 16 \\ \underline{2\frac{1}{2}} \\ 8 \\ \underline{32} \\ 40 \end{array}$$

Find products:

2. $2\frac{1}{2} \times 24$
3. $2\frac{1}{3} \times 36$
4. $4\frac{1}{4} \times 96$
5. $8\frac{1}{2} \times 84$
6. $6\frac{1}{2} \times 60$
7. $8\frac{1}{4} \times 120$
8. $7\frac{1}{3} \times 336$
9. $8\frac{1}{4} \times 124$
10. $9\frac{1}{3} \times 276$
11. $7\frac{1}{6} \times 324$
12. $5\frac{1}{8} \times 288$
13. $7\frac{1}{5} \times 240$
14. $8\frac{1}{7} \times 273$
15. $6\frac{1}{6} \times 258$
16. $8\frac{1}{8} \times 744$
17. $9\frac{1}{5} \times 275$
18. $5\frac{1}{8} \times 392$
19. $9\frac{1}{7} \times 413$

Find the cost of:

20. $8\frac{1}{2}$ gal. oil @ 12¢.
21. $6\frac{1}{4}$ bu. potatoes @ 80¢.
22. $8\frac{1}{4}$ yd. silk @ $1.20.
23. $7\frac{1}{2}$ gal. milk @ 16¢.
24. $6\frac{1}{4}$ doz. bananas @ 24¢.
25. $6\frac{1}{2}$ doz. buttons @ 54¢.
26. $7\frac{1}{4}$ yd. ribbon @ 28¢.
27. $7\frac{1}{2}$ doz. buttons @ 36¢.
28. $9\frac{1}{3}$ hours' work @ 18¢.
29. $8\frac{1}{4}$ pounds butter @ 32¢.
30. $6\frac{1}{2}$ pounds meat @ 16¢.
31. $7\frac{1}{4}$ pk. peaches @ 40¢.
32. $3\frac{1}{8}$ yd. muslin @ 16¢.
33. $4\frac{1}{4}$ lb. candy @ 60¢.

MULTIPLYING BY 9

1. Count by 9's to 27; to 54; to 72; to 108.

2. Build the table of 9's.

3. Compare 6 × 9 and 9 × 6; 8 × 9 and 9 × 8; 10 × 9 and 9 × 10.

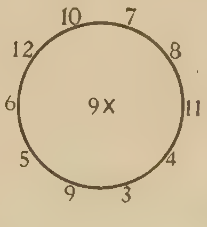
4. Multiply at sight by 9:

40 60 80 20 50 10 30 70 90 31 51 71

Table of 9's

1 × 9 = 9	7 × 9 = 63
2 × 9 = 18	8 × 9 = 72
3 × 9 = 27	9 × 9 = 81
4 × 9 = 36	10 × 9 = 90
5 × 9 = 45	11 × 9 = 99
6 × 9 = 54	12 × 9 = 108

5. Memorize the table.



Give two numbers that form each of these products:

6. 21, 36, 44, 48, 50, 40, 54, 45, 33, 18, 27, 99.

7. 88, 90, 60, 77, 81, 63, 66, 72, 56, 108, 96, 80.

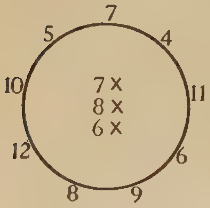
Multiply by 9:

	a	*b*	*c*	*d*	*e*
8.	4693	7286	4615	8738	6957
9.	4135	2874	6398	1869	7043
10.	8286	3697	4589	2893	9097
11.	9387	2945	9384	9387	2864
12.	6005	7894	5009	6090	7500
13.	5020	4080	3074	8005	9999

MULTIPLYING BY 9

Multiply by 9:

	a	*b*	*c*	*d*	*e*
1.	4226	8393	3786	2468	8321
2.	5483	6692	2294	8329	6245
3.	6396	2594	4968	5692	9374
4.	7278	7246	5328	7386	8928



Find the products:

5. 9 × 38 gal. 9 × 24 da. 9 × 16 min.
6. 9 × 17 bu. 9 × 25 mo. 9 × 25 horses
7. 9 × 12 ft. 9 × 18¢ 9 × 35 cows
8. Find products by 7; by 8; by 6.

Table of Elementary Products

In multiplication, there are 45 different combinations of figures taken two at a time, and 36 different products. Use these combinations for drill frequently:

1	1	1	2	1	1	3	1	1	4	1	
1	2	3	2	4	5	2	6	7	2	8	
3	1	5	6	4	7	5	4	8	9	6	
3	9	2	2	3	2	3	4	2	2	3	
5	7	8	6	5	9	7	6	8	7	6	
4	3	3	4	5	3	4	5	4	5	6	
9	8	7	9	8	7	9	8	9	8	9	9
4	5	6	5	6	7	6	7	7	8	8	9

DIVIDING BY 9

1. How many tables, at $9 each, can be bought for $18? for $27? for $36? for $45? for $63?

2. Give quotients at sight:

$63 \div 9$	$81 \div 9$	$45 \div 5$	$36 \div 4$	$108 \div 9$
$72 \div 8$	$54 \div 6$	$72 \div 9$	$27 \div 3$	$90 \div 9$
$\frac{1}{9}$ of 36	$\frac{1}{7}$ of 63	$\frac{1}{9}$ of 54	$\frac{1}{8}$ of 56	$\frac{1}{9}$ of 72
$\frac{1}{8}$ of 64	$\frac{1}{9}$ of 45	$\frac{1}{5}$ of 45	$\frac{1}{9}$ of 63	$\frac{1}{7}$ of 56

3. Tell at sight which is greater and how much:

$\frac{1}{9}$ of 81 or $\frac{1}{3}$ of 27

$\frac{1}{8}$ of 64 or $\frac{1}{2}$ of 16

$\frac{1}{8}$ of 40 or $\frac{1}{9}$ of 45

$\frac{1}{7}$ of 63 or $\frac{1}{9}$ of 81

Divide by 9; then by 8:

	a	*b*	*c*	*d*	*e*
4.	2637	1856	2934	7683	8174
5.	6385	2097	3084	6075	7238
6.	8462	3761	2985	2207	3604
7.	7581	6293	8697	2984	6093

8. Give quotients at sight:

$180 \div 9$	$360 \div 9$	$900 \div 9$	$720 \div 9$	$729 \div 9$
$279 \div 9$	$549 \div 9$	$459 \div 9$	$639 \div 9$	$450 \div 9$

9. If a postman delivers 954 letters in 9 hours, how many letters does he average in one hour?

10. How many times can 9 inches be marked off from a line $4\frac{1}{2}$ feet in length?

11. At 3 melons for 15 cents, how many melons can I buy for 45 cents?

DIVISION OF DOLLARS AND CENTS

Find the products; test and read answers:

	a	*b*	*c*
1.	4 × $2.75	7 × $82.93	8 × $93.15
2.	5 × $3.86	8 × $46.25	9 × $73.86
3.	6 × $7.27	9 × $73.87	7 × $49.25

4. Divide $6.15 by 3.

$$3\underline{)\$6.15}$$
$$\$2.05$$

Divide $6.15 by 3, placing a *decimal point* under the decimal point in the dividend. Write the dollar sign before the number of dollars in the quotient.

Find the quotients; read and test answers:

	a	*b*	*c*
5.	$4.75 ÷ 2	$6.75 ÷ 4	$29.34 ÷ 9
6.	$2.08 ÷ 2	$8.22 ÷ 6	$46.72 ÷ 8
7.	$9.27 ÷ 3	$9.05 ÷ 5	$71.05 ÷ 7

Find:

8.	$\frac{1}{3}$ of $27.15	$\frac{1}{4}$ of $16.64	$\frac{1}{7}$ of $39.34
9.	$\frac{1}{2}$ of $18.24	$\frac{1}{5}$ of $26.70	$\frac{1}{8}$ of $97.68
10.	$\frac{1}{4}$ of $20.48	$\frac{1}{6}$ of $38.40	$\frac{1}{9}$ of $27.36

Perform the operation indicated:

11.	$273.84 ÷ 6	$263.75 ÷ 8	$375.42 ÷ 6
12.	$936.25 × 5	$423.96 × 9	$495.67 ÷ 7
13.	$475.83 × 6	$928.14 ÷ 6	$321.21 ÷ 9
14.	$721.98 ÷ 9	$743.68 ÷ 7	$563.94 × 8
15.	$435.72 ÷ 8	$269.19 ÷ 9	$732.75 × 6

PRACTICAL PROBLEMS

1. It requires 4 yd. of material to make each of these girls an apron. How much will be required for the class of 7 girls?

2. At 8¢ a yd., how much will 7 aprons cost?

3. Out of $9\frac{1}{2}$ yd. of cambric, how many caps, requiring $\frac{1}{2}$ yd. each, can be made?

4. How many pupils can be supplied with rolling pins and pie pans out of $ 9, if each pin costs 20¢, and each pan 10¢?

5. At 18¢ a yard, find the cost of lawn for sleeve protectors for 7 girls, each sleeve requiring $\frac{1}{2}$ yd.

6. Miss Blew, the teacher, purchases the following: 7 flour cans @ 40¢, 7 cake pans @ 25¢, 7 sugar shakers @ 17¢. Find the amount of her purchases.

7. Entertaining the directors, this class uses 7 spring chickens @ 40¢, 2 pecks of potatoes @ 15¢, 1 head cabbage @ 8¢, 2 boxes tomatoes @ 10¢, $\frac{1}{2}$ lb. butter @ 32¢, 2 pt. cream @ 8¢, and $\frac{1}{2}$ gallon ice cream @ $ 1.50 per gallon. How much does the dinner cost them?

MULTIPLICATION AND DIVISION

Multiply and divide by 8; by 9:

	a	*b*	*c*	*d*	*e*
1.	2465	2469	2816	6824	6178
2.	7381	8397	9375	4836	8293

Find:

3. $\frac{1}{7}$ of 4683 sheep

4. $\frac{1}{8}$ of 9376 horses

5. $\frac{1}{9}$ of 7353 bu.

6. $\frac{1}{7}$ of 4347 gal.

7. $\frac{1}{8}$ of 3600

8. $\frac{1}{9}$ of 7479

How much change shall I receive from \$10 for the following? Name the coins in each purchase.

9. $2\frac{1}{2}$ yd. silk @ 60¢

10. $7\frac{1}{3}$ doz. eggs @ 30¢

11. 24 lb. butter @ \$$\frac{1}{4}$

12. $3\frac{1}{2}$ bu. plums @ \$2.50

Market Report

Grapes, per crate,	\$2.75	Peaches, per basket,	\$1.35
Blackberries, per crate,	\$3.50	Pears, per bbl.,	\$3.75
Raspberries, per crate,	\$3.65	Apples, per bbl.,	\$3.50
Elderberries, per crate,	\$1.75	Cantaloupes, per box,	\$4.50

From the above report find the cost of:

13. 4 crates of blackberries.

14. 5 baskets of peaches.

15. 3 crates of grapes.

16. 3 crates of elderberries.

17. 4 bbl. of pears.

18. 2 boxes of cantaloupes.

19. 6 bbl. of apples.

20. 9 baskets of peaches.

21. 6 crates of blackberries.

22. 5 crates of elderberries.

23. 7 crates of raspberries.

24. 6 bbl. of pears.

25. 8 boxes of cantaloupes.

26. 8 baskets of peaches.

Make other problems from this or another Market Report.

UNITED STATES MONEY

(Notice the groups that make 10 or 15.)

Add:

	a		*b*		*c*	*d*	*e*
1.	$15.73		$30.86	15	$ 6.93	$ .48	$ .17
	6.98		15.29		32.63	2.75	.28
	.37	15	8.88		4.30	.76	5.70
	5.18		.68	15	12.51	5.85	16.37
	40.60		7.27		8.78	40.20	4.70
	5.89	10	23.85	10	.36	6.58	23.96
	.31		.25		.50	18.64	.85

2. Mr. Foster sold in 5 days as follows. Find each day's sales, total sales, and receipts for each article.

	MON.	TUES.	WED.	THURS.	FRI.
	a	*b*	*c*	*d*	*e*
Corn	$75.25	$68.75	$27.35	$87.45	$64.65
Oats	18.42	26.73	16.72	29.63	37.26
Bran	6.75	3.75	8.25	7.75	9.45
Chop	12.34	8.65	17.38	15.24	16.28
Meal	3.60	5.40	7.60	12.60	17.20
Flour	47.25	68.25	78.75	89.25	110.25

3. A man made 7 deposits as follows: $145.75, $123.34, $134.89, $645.75, $800.05, $900.25, $845.52. How much money did he deposit?

4. My expenses for 6 days were respectively, $1.42, $2.05, $2.36, $2.12, $1.45, and $2.15. What were my expenses for the week?

SUBTRACTION

1. From 5000 take 3456.

$$\begin{array}{cccc} {\scriptstyle 4} & {\scriptstyle 9} & {\scriptstyle 9} & {\scriptstyle 10} \\ 5 & 0 & 0 & 0 \\ 3 & 4 & 5 & 6 \\ \hline 1 & 5 & 4 & 4 \end{array}$$

6 from 10 leaves 4
5 from 9 leaves 4
4 from 9 leaves 5
3 from 4 leaves 1

	a	*b*	*c*	*d*	*e*
2.	6734	8090	7004	6000	9000
	4578	5694	5896	4187	3999
	2156	2396	1108	1813	5001

Subtract:

	a	*b*	*c*	*d*	*e*
3.	9084	7604	5003	8460	6080
	6097	4909	3806	7469	5908
4.	9600	7039	6800	7001	4403
	3097	6799	5009	1903	3040
5.	5004	8040	7409	6400	7003
	3904	4409	3790	4986	6800
6.	8703	6009	8001	5904	9873
	5008	4939	6809	3400	4980
7.	7003	5900	9204	7405	5900
	4906	3098	8909	6097	4397

TEST EXERCISES

Multiply, practicing until nine products can be found in 2 minutes.

1. 4987 by 7
2. 6879 by 8
3. 9836 by 9
4. 2475 by 8
5. 8689 by 9
6. 3978 by 7
7. 6894 by 9
8. 9829 by 7
9. 6375 by 8

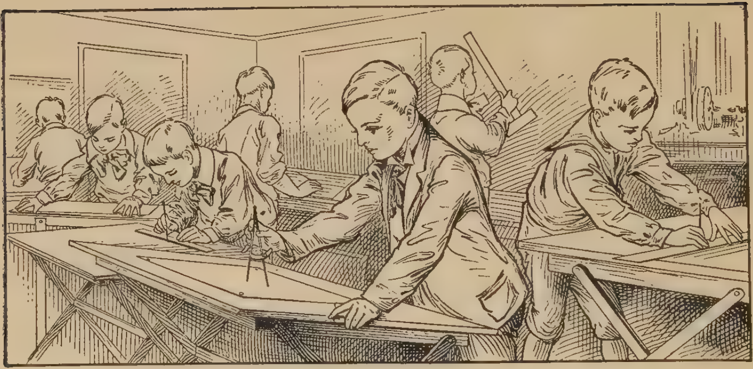
10. 8564 by 7
11. 9873 by 9
12. 8293 by 8
13. 8739 by 9
14. 6927 by 8
15. 8738 by 9
16. 8795 by 9
17. 6938 by 7
18. 9375 by 8

19. 9365 by 8
20. 8796 by 9
21. 2493 by 7
22. 7693 by 7
23. 8795 by 8
24. 9283 by 9
25. 8756 by 9
26. 7938 by 9
27. 4695 by 7

Add rapidly:

	a	*b*	*c*	*d*	*e*
28.	2401	2409	8145	3629	8873
	6375	3875	2693	9483	2345
	5816	4693	7856	2637	5690
	2487	9301	9037	3415	2295
	1789	1432	5009	8007	7986
29.	7895	9982	7743	2239	4498
	2398	1028	3838	4075	7659
	2015	5690	9723	9320	3376
	1920	5497	4587	8756	5072
	6099	4705	8243	6008	3490

PRACTICAL PROBLEMS



1. The drafting room is 24 feet wide and 28 feet long. What is the distance around the room?

2. There are 7 stands in the room. Each one cost $ 5.50. What was the cost of all?

3. Each stand requires a "T" square, angles, scale, erasers, thumb-tacks, etc. The instruments cost $ 28.35. What was the average cost of each stand?

4. The first class worked 40 minutes on Monday and Friday of each school week. How many minutes were spent by the class during 4 school weeks?

5. Each of 7 boys required a drafting board costing 50¢, ink, paper, pencils, etc., costing 25¢. What was the cost of these materials for the class?

6. The boys made two chairs valued at $ 8.75 each, 3 tabourettes at $ 3.25 each, and 4 book racks at $ 1.25 each. What was the value of all the articles?

TEST EXERCISES

Divide, practicing until the quotients for 9 problems can be found in 2 minutes:

1. 2873 by 7
2. 9865 by 8
3. 4793 by 9
4. 8196 by 8
5. 7963 by 9
6. 8910 by 7
7. 2403 by 9
8. 8173 by 8
9. 6294 by 9

10. 7386 by 8
11. 8794 by 9
12. 9387 by 9
13. 8197 by 8
14. 6934 by 9
15. 7879 by 7
16. 4003 by 8
17. 6920 by 7
18. 3784 by 9

19. 9234 by 7
20. 6875 by 8
21. 4132 by 9
22. 6010 by 9
23. 5362 by 7
24. 8104 by 8
25. 3215 by 7
26. 8629 by 9
27. 9273 by 8

Subtract rapidly:

28. 4284 – 2141
29. 8401 – 1762
30. 8109 – 4777
31. 8001 – 6448
32. 6001 – 4999
33. 9845 – 3677
34. 8004 – 2234
35. 7982 – 5460
36. 5698 – 3472

37. 6024 – 5107
38. 8460 – 6418
39. 7200 – 4540
40. 9045 – 4254
41. 8700 – 4286
42. 8760 – 4197
43. 3498 – 2004
44. 6699 – 3342
45. 7583 – 5620

46. 8794 – 4587
47. 8476 – 7421
48. 8921 – 5879
49. 6001 – 2478
50. 6424 – 3150
51. 4030 – 3289
52. 5590 – 1056
53. 9930 – 7810
54. 9706 – 5897

PRACTICAL PROBLEMS

1. A huckster's sales for the week were as follows: $3.25, $7.15, $2.45, $6.45, and $8.79. What was the amount of his sales?

2. A boy's suit that was marked $6.98 was sold for $1.25 less. What was the selling price of the suit?

3. James had $5.94; he spent $2.85. How much had he left?

4. What is the difference in the price of two hats marked $4.50 and $3.60?

5. The following amounts were deposited in the school savings bank: $2.15, $1.65, $7.09, $3.68, and $9.15. What was the total of these deposits?

6. Mrs. Jones paid $2.75 for a turkey, $.30 for cranberries, $.15 for butter, and $.48 for coffee. What was the whole cost?

7. How many school badges 4 in. long can be made from 2 yd. of ribbon?

8. A clock that strikes the half hours strikes how many times in a day?

9. How many square inches are there in an 8-inch square?

10. There are 639 oranges in 9 baskets, with the same number in each. How many are there in each basket?

11. If you receive $2.75, $6.96, and $8.15 and want to change it into five-dollar bills, how many should you get and how much money over?

COMPARISON

1. Compare 10 with 5; thus, 10 is two times 5.

2. Compare 5 with 10; thus, 5 is $\frac{1}{2}$ of 10.

NOTE. — We might also compare 5 with 10 by saying 10 is 5 more than 5; but, unless otherwise stated, "compare" in this book means "find the quotient of the first number divided by the second."

3. Compare 30 with 10; 20 with 5; 24 with 6.

4. Compare 5 with 15; 8 with 24; 12 with 48.

5. Compare 40 with 10; with 8; with 5; with 4.

6. Compare 25 with 5; 5 with 25.

7. When 2 pencils cost 10¢, how much will 8 cost?

8. When 6 hats cost $12, how much will 12 cost?

9. When 4 knives cost $6, how much will 8 cost?

10. At 6 pens for 10¢, how much will 18 cost?

11. When 6 horses cost $900, how much will 24 cost?

24 horses are 4 times 6 horses. Hence, they will cost 4 × $900, or $3600.

12. When 5 cows cost $160, how much will 30 cost?

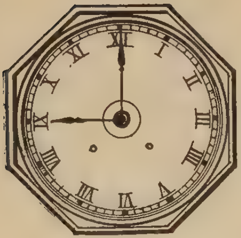
13. When 3 barrels of apples cost $7.50, how much will 12 cost?

14. If 5 tons of hard coal cost $32.50, how much will 30 tons cost?

15. At $45 for 60 bu. of wheat, how much will 12 bu. cost?

16. If 12 men earn $51 in one day, how much will 60 men earn in one day at the same rate?

MEASURES OF TIME



1. Name the letters on the face of the clock. Tell the time.

2. Observe the small spaces on the outer edge of the face. These are called **minute** spaces.

3. Over how many of these spaces does the long or **minute hand** move in passing around the face from XII to XII again?

4. How long is the minute hand in passing from XII to I? from V to VI? from X to XI?

5. There are the same number of minute spaces between any two hours.

6. While the minute hand passes from XII to XII again, how far does the short or **hour hand** move?

7. How many minutes are there in an hour? in 2 hr.? in 4 hr.? in $\frac{1}{2}$ hr.?

8. When the hour hand is at XII, what is the time if the minute hand points to V? to III? to I?

9. Count the hours on the clock face from 9 o'clock, the opening of school, until 9 o'clock, the next morning. How many are there? These 24 hours include both day time and night time.

60 minutes = 1 hour; written, 60 min. = 1 hr.
24 hours = 1 day; written, 24 hr. = 1 da.

The day always begins at XII, **midnight.** The time from midnight to noon is called **forenoon.** The time from XII, noon, to midnight is called **afternoon.**

We write **A.M.** for *forenoon* and **P.M.** for *afternoon.* 8 : 20 A.M. is read 20 minutes past eight in the morning.

10. Read 6:10 A.M.; 4:25 A.M.; 6:30 P.M.; 6:45 P.M.; 10:00 A.M.; 5:05 P.M.

11. How many hours is it from 9 A.M. to 5 P.M.? from 10 P.M. to 6 A.M.?

12. How many days is it from 9 o'clock Monday morning to 9 o'clock the next Monday morning?

7 days = 1 week; written, 7 da. = 1 wk.

13. On what day did Feb. 1, 1907, fall? Make a calendar for February, 1907, similar to the one for January.

14. Name the months of the year, beginning with January.

1907 JANUARY 1907

SUN	MON	TUE	WED	THU	FRI	SAT
..	..	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	..	..

12 months = 1 year; written, 12 mo. = 1 yr.

15. How many months are there in 8 years?

16. How many days are there in 6 weeks?

17. How many hours are there in 9 days?

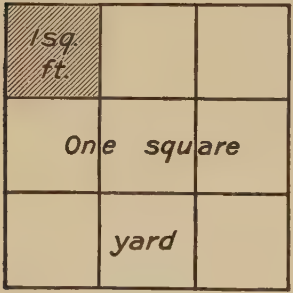
18. How many minutes are there in 4 hours?

MEASURES OF SURFACE

1. Draw a square 1 inch long and 1 inch wide. What shall we call it?

2. Draw on the blackboard a square 1 foot long and 1 foot wide. Call it a **square foot.**

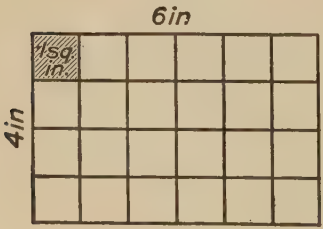
3. Draw on the blackboard a square 1 yard long and 1 yard wide. Call it a **square yard.**



4. Separate by points, each side of the square yard into 3 equal parts. Connect these points by straight lines. What is the size of each square? How many square feet are there in a square yard?

5. This picture shows a square yard, smaller than it really is. How many square feet does it show?

9 square feet = 1 square yard; written, 9 sq. ft. = 1 sq. yd.



6. This picture shows an oblong 6 inches by 4 inches. Divide it into square inches. How many square inches are there in one row? in 2 rows? in 3 rows? in 4 rows?

In 1 row there are 6 sq. in.
In 4 rows there are 4 × 6 sq. in. = 24 sq. in.

SURFACES

Draw figures and find the number of square inches in:

1. An oblong 1 in. wide and 4 in. long.
2. An oblong 2 in. wide and 6 in. long.
3. An envelope 2 in. wide and 6 in. long.
4. A blotter 3 in. wide and 6 in. long.
5. A page 4 in. wide and 6 in. long.
6. A square 3 in. on a side.
7. A square 4 in. on a side.
8. The top of a box 5 in. on a side.
9. A picture 4 in. by 6 in.

With one inch representing a foot, draw figures and find the number of square feet in:

10. A rug 3 ft. wide and 8 ft. long.
11. A hallway 4 ft. wide and 10 ft. long.
12. A table cover 7 ft. by 4 ft.
13. A window glass 4 ft. by 9 ft.
14. The glass for a picture 2 ft. by 3 ft.

With one inch representing a yard, draw figures and find the number of square yards in:

15. A room 4 yards by 6 yards.
16. A porch floor 2 yards wide and 8 yards long.
17. A hallway 3 yards wide and 12 yards long.
18. A rug 3 yards wide and 5 yards long.
19. A porch rug 2 yards wide and 4 yards long.
20. A wall 3 yards in height and 6 yards long.
21. A blackboard 1 yard in height and 8 yards long.

PRACTICAL PROBLEMS

Market Report

Apples. Best, $2.25;
Fair grades, $1.50 per bbl.
Peaches. Good, $2.25;
Fancy, $2.50 per bu.
Pears. Best, $1.50 per bu.
Grapes. Niagara, 25¢ per 10-lb. basket.
Concords, 28¢ per 10-lb. basket.
Eggs. 18¢ per doz.
Butter. Creamery, 28¢ per lb.;
Dairy, 25¢ per lb.
Cheese. Full cream, $12\frac{1}{2}$¢ per lb.
American, 15¢ per lb.
Potatoes. 50¢ per bu.
Sweet potatoes. Virginia, 80¢;
Jersey, $1.25 per bu.

From this market report find the cost of the following:

1. 8 bu. of fancy peaches.

2. $4\frac{1}{2}$ lb. of butter, creamery.

3. $5\frac{1}{2}$ bu. of potatoes.

4. 8 10-lb. baskets of Concord grapes.

5. 7 bbl. of apples, best quality.

6. 9 cases of eggs, 30 dozen each.

7. 8 10-lb. baskets of Niagara grapes.

8. $8\frac{1}{2}$ bu. of sweet potatoes, Virginia.

9. 7 bu. of peaches, good.

10. 9 full cream cheese, 15 lb. each.

11. 7 10-lb. baskets of Concord grapes.

12. $9\frac{1}{2}$ bu. of pears, best quality.

13. 8 bbl. of apples, fair grades.

14. 7 lb. of creamery butter and 32 lb. of dairy butter.

15. 8 bu. of fancy peaches, and 42 bu., good quality.

16. 8 10-lb. baskets of Concord grapes, and 6 10-lb. baskets of Niagara grapes.

REVIEW OF THIRD YEAR

1. There are 8 pints in one gallon. How many pints are there in 36 gallons?

2. A train runs 26 miles in 1 hour. How far can it run in 9 hours?

3. How much will $8\frac{1}{4}$ yards of cloth cost at 32 cents per yard?

4. At the rate of 9 pages an hour, how long will it take to finish a story of 27 pages?

5. Nine girls spent $4.95 at a picnic. What was the average amount spent by each?

6. At 6 cents a pound, how many pounds of sugar can be bought for 138 cents?

7. There are 168 cabbage plants in 8 rows. How many are there in each row?

8. James saves $7 a week from his wages. How long will it take him to pay for a lot valued at $238?

9. A drover paid $2040 for sheep at $6 a head. How many did he buy?

10. Eight lamps cost $17.28. Find the cost of one.

11. How many bushels equal 396 pecks?

12. How many gallons equal 792 pints?

13. How many tons of coal at $6 a ton can be bought for $786?

14. How much milk at 8 cents a quart can be bought for $2.56? ($2.56 = 256¢.)

15. I paid $12.54 for berries at 6 cents a box. How many boxes did I buy?

16. A man divided $875 among his 7 children. How much did each child receive?

17. How many weeks are equal to 287 days?

18. If 9 hours' work is counted as a day's work, for how many days should a man be paid who has worked 342 hours?

19. 6 melons cost 78 cents. How much is that apiece?

20. How many yards equal 54 feet?

21. At 48 cents a gallon, what is the cost of a pint of molasses?

22. If 6 barrels of apples cost $13.50, what is the cost of 1 barrel?

Find the cost of:

23. 8 hats @ $3.
24. 7 beds @ $9.
25. 7 qt. milk @ 8¢.
26. 8 books @ $2.
27. 4 gal. oil @ 25¢.
28. 6 chairs @ $$3\frac{1}{2}$.
29. 7 pr. shoes @ $$4\frac{1}{2}$.
30. 12 melons @ 8¢.
31. 6 bbl. flour @ $$4\frac{1}{2}$.
32. $7\frac{1}{2}$ lb. sugar @ 8¢.
33. 8 yd. of cloth @ 50¢.
34. 8 spools thread @ 10¢.

35. Eight men paid $2.50 each to the Fresh Air Fund. How much was given by all?

36. Mr. Brown paid $400 for 8 acres of land. How much were 24 acres worth?

37. Seven o'clock A.M. is how many hours after midnight?

38. 144 square inches make one square foot. How many square inches equal 8 square feet?

39. At $7.50 each, how much will 7 suits of clothing cost?

40. How much will 8¼ pounds of pork cost at 12¢ a pound?

41. At $4.75 each, how much will 8 hats cost?

42. Mrs. White paid $2.25 a yard for velvet. How much would she pay for 7 yards at the same rate?

43. Joseph Black employs 8 clerks at a salary of $15.50 a week each. How much must he pay his clerks at the end of the week?

44. At 3 palings to the foot, how many palings are required for a fence 12 yards and 2 feet in length?

45. How much will an 8½ pound roast of veal cost at 16¢ a pound?

46. 8 gallons of ice cream were sold at 15¢ a pint. How much was received for it?

47. At 25¢ a peck, for how much will 2 bu. of tomatoes retail?

48. A man sold a horse for $230 and lost $56. How much did the horse cost him?

49. Mr. Frank rented a house at $360 a year. How much rent will he pay in 7½ years?

50. A man hires a horse for 35¢ an hour. How much must he pay if he uses the horse from 10 A.M. until 5 P.M.?

51. A man bought a lot for $1275. He built a storeroom on it for $2450. He sold the property for $5000. Find his gain.

52. What is the weight of 6 sacks of wheat, each weighing 168 pounds?

53. How much will 8½ tons of coal cost at $4.50 a ton?

54. 9 tons of coal for a school cost $38.25. How much was that a ton?

55. A school has 2 floors, with 4 rooms on each floor. How many pupils are there in the school, if there are 36 pupils in each room?

56. A teacher in this school earns $65 per month, and spends $35. How much does he save in 9 months?

57. Find the cost of 8½ yards of dress goods at 48 cents per yard.

58. A pair of shoes costs $2½. How much will 7 pairs cost?

59. If I pay 96 cents for 3 yards of ribbon, how much should I pay for 1 yard? for 1½ yards?

60. The distance from New York to Pittsburg is 444 miles. What is the fare for a round trip, at 2¢ per mile?

PART III — FOURTH YEAR

READING AND WRITING NUMBERS

Review pages 29, 30, and 72.

For convenience in reading large numbers, the figures are generally separated by commas into groups of three figures each, called **periods**.

The first period, counting from the right, is **units**; the second, **thousands**; the third, **millions**.

The following table shows the arrangement of these periods, and the three orders of figures in each period:

Millions' Period			Thousands' Period			Units' Period		
Hundred-millions	Ten-millions	Millions	Hundred-thousands	Ten-thousands	Thousands	Hundreds	Tens	Ones
2	0	4,	6	4	1,	3	7	6

The number in the table is read, "204 million, 641 thousand, 376."

Copy, point off, and read:

	a	*b*	*c*	*d*
1.	2000	20135	81125	125125
2.	20000	20648	48760	625840
3.	21000	56506	40084	1760894
4.	36000	94600	61006	8300404

READING AND WRITING NUMBERS

Express in figures:

1. Forty-two thousand.
2. Sixty-six thousand four.
3. Seventy-five thousand fifty.
4. Thirty-nine thousand one hundred twenty-two.
5. Two hundred ten thousand three hundred fifty.
6. Five hundred sixty-five thousand one hundred.
7. One million one hundred twenty-five thousand.
8. Three million six hundred thousand thirty-five.
9. Twenty-five million nine thousand twenty-six.
10. Eighty million twenty-six thousand sixty-four.
11. Nine hundred thousand nine.
12. Forty-six million four thousand sixteen.
13. One hundred ten million five hundred.
14. Three hundred thirty-six million one hundred four.
15. Five hundred seven million five thousand six.
16. Seventeen million three thousand seventy-five.
17. One million two thousand seven hundred four.
18. 1 million, 104 thousand, 185.
19. 21 million, 110 thousand, 109.
20. 604 million, 622 thousand, 468.
21. 101 million, 10 thousand, 10.

ADDITION AND SUBTRACTION

Review pages 32 to 43, 54, 55, 63, 64, 65, 73, 91, and 92.

1. Count by 4's from 2 to 100; from 3 to 99.

2. Count by 6's from 3 to 99; from 5 to 101.

3. Count by 8's from 3 to 99; from 4 to 100.

Add the following, allowing five minutes for each:

	a		*b*		*c*		*d*		
4.	$32.45	+	$50.75	+	$32.11	+	$321.65	=	
	61.79	+	1.24	+	2.84	+	94.76	=	
	8.15	+	6.19	+	16.31	+	8.92	=	
	23.42	+	83.72	+	5.49	+	143.74	=	
	94.76	+	9.85	+	26.32	+	25.81	=	
	$	+	$	+	$	+	$	=	$
5.	$35.18	+	$85.24	+	$21.89	+	$ 86.42	=	
	92.76	+	8.93	+	39.65	+	93.84	=	
	9.84	+	16.82	+	84.21	+	2.69	=	
	26.37	+	73.25	+	16.93	+	39.87	=	
	81.74	+	4.68	+	12.85	+	71.44	=	
	$	+	$	+	$	+	$	=	$

Subtract, allowing one half minute for each:

	a	*b*	*c*	*d*
6.	$275.43 167.35	$536.75 308.28	$408.37 286.58	$674.26 210.75
7.	$682.72 79.80	$826.45 60.76	$527.05 89.98	$763.72 140.80

PRACTICAL PROBLEMS

1. A man paid $2.50 for a hat and $15.50 for a suit. How much did he pay for both?

$2.50, cost of hat.
15.50, cost of suit.
$18.00, cost of both.

2. A merchant sold 425 bu. of potatoes, 232 bu. of apples, and 189 bu. of onions. Find the total number of bushels sold.

3. A lady paid $25 for a carpet, $71 for a rug, and $7 for curtains. What was the amount of her bill?

4. How many days are there in the last six months of the year?

5. A man left his estate to his wife, son, and daughter. His wife received $9845, his son $3650, and his daughter $3500. What was the value of the whole estate?

6. I sold my house for $5675, thereby losing $897. How much did the house cost?

7. A lawn is 30 ft. long and 24 ft. wide. How many feet is it around the lawn?

8. New York is 327 miles east of Altoona by railroad and Pittsburg is 117 miles west. How far is it from New York to Pittsburg?

9. The pupils of a school deposited money in a savings bank as follows: January, $16.45; February, $14.60; March, $18.35; and April, $17.51. Find the total deposits.

PRACTICAL PROBLEMS

1. A ranchman bought 468 cows and sold 239 of them. How many had he left?

468, number of cows bought.
239, number of cows sold.
229, number of cows remaining.

2. Mr. Jones was born in 1851. How many years old is he if now living?

3. A man's property sells for $47892. He owes $36987. How much has he left after paying all his debts?

4. In a certain election A received 38714 votes and B 29867 votes. How much did A's vote exceed B's?

5. I sold a farm for $5628, which was at a gain of $1394. What was the cost of the farm?

6. A merchant bought 26520 bu. of grain and sold 18296 bu. How many bushels had he left?

7. The population of a town is 8596. Ten years ago it was 2397. What was the increase in ten years?

8. A man's salary is $2525 a year. His expenses are $1786. How much can he save in a year?

9. A barrel of flour weighs 200 lb. The barrel itself weighs 4 lb. How many pounds of flour are there in a barrel?

10. At an election the whole number of ballots cast was 11342. Of this number A received 8673. How many votes were cast for his opponent?

MULTIPLYING BY 10

Review pages 56, 59, 66, 79, 80, 85, and 86.

1. Count by 10's to 100. Build the table of 10's.

2. How many are 9 × 10? 90 + ? = 100.

3. Place a naught to the right of 4. What number have you? 40 is how many times four? Place a naught to the right of 6; 3; 7; 9; 11; 12. See whether each product has become ten times the minuend.

Annexing a naught to the right of a number multiplies it by 10.

4. Annex 0 to each number. Notice the effect:

4 20 36 75 42 87 275
93 87 692 387 509 938 765

Table of 10's

1 × 10 = 10
2 × 10 = 20
3 × 10 = 30
4 × 10 = 40
5 × 10 = 50
6 × 10 = 60
7 × 10 = 70
8 × 10 = 80
9 × 10 = 90
10 × 10 = 100
11 × 10 = 110
12 × 10 = 120

5. Memorize the table.

6. Compare:

10 × 5 with 5 × 10
8 × 10 with 10 × 8
11 × 10 with 10 × 11
40 and 80
100 and 10
120 and 12
110 and 11

Find the cost of:

7. 10 newspapers @ 5¢.
8. 8 ladies' hats @ $5.
9. 10 oranges @ 2 for 5¢.
10. $10\frac{1}{2}$ yd. muslin @ 12¢.
11. $9\frac{1}{2}$ lb. lard @ 10¢.
12. $12\frac{1}{2}$ doz. buttons @ 10¢.
13. 10 qt. milk @ 8¢.
14. $10\frac{1}{4}$ bu. tomatoes @ 80¢.

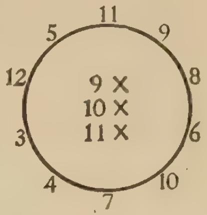
MULTIPLYING BY 11

1. Count by 11's to 33; to 66; to 99. Build the table of 11's.

2. $9 \times 11 = ?$ $99 + 11 = ?$ How many 11's $= 110$?

3. $10 \times 11 = ?$ 10 times 11, plus $11 = ?$ How many are 11×11?

4. To find 12×11 how many must be added to 11×11? $12 \times 11 = ?$



5. Give at sight:

10×11　12×11　5×11
3×11　4×11　8×11
6×11　11×9　11×7

Table of 11's

$1 \times 11 = 11$	$7 \times 11 = 77$
$2 \times 11 = 22$	$8 \times 11 = 88$
$3 \times 11 = 33$	$9 \times 11 = 99$
$4 \times 11 = 44$	$10 \times 11 = 110$
$5 \times 11 = 55$	$11 \times 11 = 121$
$6 \times 11 = 66$	$12 \times 11 = 132$

6. Memorize the table.

7. Compare:

11×7 with 7×11
9×11 with 11×9
11×4 with 4×11
12×11 with 11×12
6×11 with 11×6

8. Find the products:

11×60　11×80　11×40　11×100　11×30
11×90　11×50　11×20　11×80　11×25
11×13　11×30　11×70　11×15　11×18

Find:

9. $\frac{1}{11}$ of 132; of 88; of 121; of 110.

MULTIPLYING BY 12

1. Count by 12's to 36; to 72; to 144. How many are 12 times 12? Build the table of 12's.

Table of 12's

1 × 12 = 12	7 × 12 = 84
2 × 12 = 24	8 × 12 = 96
3 × 12 = 36	9 × 12 = 108
4 × 12 = 48	10 × 12 = 120
5 × 12 = 60	11 × 12 = 132
6 × 12 = 72	12 × 12 = 144

2. Memorize the table.

3. Multiply by 12; by 11:

465	236	789
546	783	928
784	937	693
785	514	938
978	694	296

1 dozen = 12 1 gross = 144

4. What two numbers make the following products?

25	27	28	30	32	35	36	40	42	45	48
49	56	60	63	64	66	72	80	84	88	96

MULTIPLICATION BY A MIXED NUMBER

1. Multiply 34 by $4\frac{1}{2}$. $4\frac{1}{2}$ times 34 means that $\frac{1}{2}$ of 34 is to be added to 4 × 34.

$$\begin{array}{r l} 34 & \\ \underline{4\frac{1}{2}} & \\ 17 & = \frac{1}{2} \text{ of } 34 \\ \underline{136} & = \underline{4} \text{ times } 34 \\ 153 & = 4\frac{1}{2} \text{ times } 34 \end{array}$$

Find the products:

2. $8\frac{1}{2} \times 48$

3. $9\frac{1}{3} \times 72$

4. $8\frac{1}{4} \times 120$

5. $6\frac{1}{3} \times 180$

6. $7\frac{1}{4} \times 84$

7. $5\frac{1}{2} \times 242$

8. $12\frac{1}{2} \times 224$

DIVIDING BY 10

1. Begin with 0 and count by 10's to 100. Beginning with 1 count by 10's to 101.

2. 50 is how many times 5? How does 60 compare with 6? Remove zero from 80. What is the result? 8 is what part of 80?

3. Remove naught from 30; from 90; from 70. How does the result in each case compare with the number?

4. 3 is what part of 30? 4 is what part of 40? $\frac{1}{10}$ of $40 = ?$

Removing a naught from the right of any number divides it by 10.

5. Divide by 10: Complete in two minutes.

40	30	90	80	60	100	120
320	560	980	750	360	470	920
1450	1680	2450	1930	2210	9990	7400
6320	4040	3100	2010	8500	7280	6900

6. How many 10-cent balls can be bought for $1.00? for $2.00? for $5.00?

7. At 10 cents a quart, how many quarts of milk can be bought with $2.80?

8. How long will it take a motor car going 10 miles an hour to travel 140 miles?

9. If I pay 50¢ for a telegram of 10 words, how much do I pay for each word?

DIVIDING BY 11 AND 12

1. Subtract by 11's from 132 to 0.

2. State quotients at sight:

$33 \div 11$
$44 \div 11$
$66 \div 11$
$77 \div 11$
$88 \div 11$
$99 \div 11$
$132 \div 11$
$121 \div 11$

3. Find $\frac{1}{11}$ of: 88; 99; 22; 78; 33; 48; 44; 55; 69; 11; 66; 81; 77; 92; 88; 99; 110; 121; 83.

Divide by 11: Test answers.

4. 2738
5. 8294
6. 2036
7. 6954
8. 3986
9. 3007
10. 8923
11. 2158
12. 8057
13. 69753
14. 73065
15. 90074

16. Subtract by 12's from 144 to 0.

17. State quotients at sight:

$36 \div 12$
$24 \div 12$
$60 \div 12$
$96 \div 12$
$84 \div 12$
$108 \div 12$
$132 \div 12$
$144 \div 12$

18. Find $\frac{1}{12}$ of: 96; 84; 72; 36; 108; 24; 120; 132; 60; 48; 144.

Divide by 12: Test answers.

19. 3678
20. 4135
21. 6973
22. 7128
23. 4693
24. 7817
25. 2936
26. 9238
27. 4697
28. 9384
29. 42192
30. 69378
31. 73945
32. 82659
33. 37296
34. 91875
35. 24726
36. 68359
37. 81763
38. 92364

REVIEW

Find the cost of:

1. 9 rings @ $3
2. 12 cows @ $35
3. 10 hats @ $3.65
4. 10 rugs @ $1.50
5. 3 wagons @ $85
6. 9 plates @ $1.75
7. 10 knives @ $.75
8. 10 vases @ $2.39
9. 10 horses @ $95
10. 11 books @ $2.25
11. 11 sheep @ $4.75
12. 10 chairs @ $5.25
13. 6 chickens @ 75¢
14. 12 pictures @ $4.50

Find the cost of 1, when:

15. 12 lamps cost $51
16. 4 cases cost $32.48
17. 10 sleds cost $19.50
18. 10 sheep cost $45.00
19. 11 desks cost $35.75
20. 8 trunks cost $57.60
21. 10 clocks cost $48.50
22. 5 hats cost $15
23. 12 hats cost $27
24. 8 lb. rice cost 96¢
25. 3 clocks cost $9.75
26. 9 books cost $11.25
27. 5 chairs cost $15.45
28. 9 lb. nuts cost $2.25
29. 8 bu. coal cost $1.20
30. 10 satchels cost $35.50
31. 12 yd. lace cost 48¢
32. 11 lb. steak cost $1.98
33. 6 gal. vinegar cost 72¢
34. 12 bu. potatoes cost $9
35. 12 pk. tomatoes cost $3
36. 10 toy engines cost $35
37. 5 lb. steak cost $1.10
38. 8 qt. cream cost $1.60
39. 4 bu. cherries cost $15
40. 10 yd. silk cost $17.50
41. 10 pt. cream cost $1.10
42. 11 lb. butter cost $2.20
43. 3 pairs shoes cost $9.75
44. 12 collars cost $2.40

REVIEW

1. A train runs 378 miles in 7 hours. How many miles is that in 1 hour?

2. A ticket agent has $5.85 in his drawer. After selling 2 tickets at 90¢ each, 8 tickets at 70¢ each, and 1 mileage book for $20, how much money should his drawer contain?

3. While the hour hand is going 8 times around the dial how often does the minute hand go around?

4. The treasury of a school district contains $2642. After paying the salaries of six teachers for 8 months at $45 per month, how much remains?

5. A farmer sold 4 jars of butter containing respectively, 24 pounds, 27 pounds, 26 pounds, and 33 pounds. How many pounds did he sell?

6. A newsboy earns 30 cents a day. How much will he earn in 4 weeks of 6 days each?

7. What is left from a $10 bill after paying for $10\frac{1}{2}$ lb. of tea at 60 cents a pound?

8. The expenses for a family for a year are as follows: food, $485; fuel and light, $86; car fare, $35; clothing, $285; church, $68; books and papers, $25; servant, $165; other expenses, $278. Find the entire expenses.

9. In a school of 897 pupils, there are 487 girls. How many boys are there?

DRILL WORK

Write and add:

	a	*b*	*c*
1.	$ 2785.00	$ 5870.00	$ 475.00
	597.55	29.60	6000.00
	3000.00	587.25	459.06
	987.46	45.03	250.00
	6750.00	6540.20	4278.64
	5340.02	8750.00	5782.98
	9876.54	2346.59	8796.32
	3201.89	4567.83	4123.56
2.	$ 6004.50	$ 6550.00	$ 2987.35
	887.95	278.93	500.83
	504.06	8.10	6789.05
	2874.59	200.02	200.06
	850.00	7007.05	678.46
	2250.05	520.84	4586.23
	275.83	4265.63	2080.95
	7817.89	6005.80	2345.10
3.	$ 475.00	$ 1286.40	$ 7665.00
	6000.20	587.52	2050.50
	579.80	3873.20	2002.02
	1000.50	78.00	879.30
	457.39	759.06	698.09
	100.10	9300.00	5000.10
	4555.05	759.84	898.45
	7016.89	5234.18	4987.56

DRILL WORK

Subtract and test 5 problems in 1 minute.

	a	*b*	*c*	*d*
1.	$860.45 178.62	$874.61 126.42	$724.82 109.87	$870.62 188.94
2.	$684.26 397.84	$962.41 802.96	$921.08 120.09	$700.64 188.96
3.	$784.12 479.63	$908.07 194.72	$916.25 721.24	$864.30 497.86
4.	$876.42 91.76	$900.40 87.80	$921.11 888.66	$422.33 188.88
5.	$600.03 187.69	$744.44 299.99	$800.55 288.85	$111.21 108.89
6.	$700.77 188.99	$644.41 387.64	$854.32 123.45	$765.43 112.34
7.	$842.16 199.97	$964.21 188.74	$841.22 108.62	$742.24 604.28
8.	$914.79 549.86	$305.00 128.95	$965.06 578.98	$821.00 367.89

MULTIPLICATION TABLE

Review and memorize:

1 × 1 = 1	1 × 2 = 2	1 × 3 = 3	1 × 4 = 4
2 × 1 = 2	2 × 2 = 4	2 × 3 = 6	2 × 4 = 8
3 × 1 = 3	3 × 2 = 6	3 × 3 = 9	3 × 4 = 12
4 × 1 = 4	4 × 2 = 8	4 × 3 = 12	4 × 4 = 16
5 × 1 = 5	5 × 2 = 10	5 × 3 = 15	5 × 4 = 20
6 × 1 = 6	6 × 2 = 12	6 × 3 = 18	6 × 4 = 24
7 × 1 = 7	7 × 2 = 14	7 × 3 = 21	7 × 4 = 28
8 × 1 = 8	8 × 2 = 16	8 × 3 = 24	8 × 4 = 32
9 × 1 = 9	9 × 2 = 18	9 × 3 = 27	9 × 4 = 36
10 × 1 = 10	10 × 2 = 20	10 × 3 = 30	10 × 4 = 40
11 × 1 = 11	11 × 2 = 22	11 × 3 = 33	11 × 4 = 44
12 × 1 = 12	12 × 2 = 24	12 × 3 = 36	12 × 4 = 48
1 × 5 = 5	1 × 6 = 6	1 × 7 = 7	1 × 8 = 8
2 × 5 = 10	2 × 6 = 12	2 × 7 = 14	2 × 8 = 16
3 × 5 = 15	3 × 6 = 18	3 × 7 = 21	3 × 8 = 24
4 × 5 = 20	4 × 6 = 24	4 × 7 = 28	4 × 8 = 32
5 × 5 = 25	5 × 6 = 30	5 × 7 = 35	5 × 8 = 40
6 × 5 = 30	6 × 6 = 36	6 × 7 = 42	6 × 8 = 48
7 × 5 = 35	7 × 6 = 42	7 × 7 = 49	7 × 8 = 56
8 × 5 = 40	8 × 6 = 48	8 × 7 = 56	8 × 8 = 64
9 × 5 = 45	9 × 6 = 54	9 × 7 = 63	9 × 8 = 72
10 × 5 = 50	10 × 6 = 60	10 × 7 = 70	10 × 8 = 80
11 × 5 = 55	11 × 6 = 66	11 × 7 = 77	11 × 8 = 88
12 × 5 = 60	12 × 6 = 72	12 × 7 = 84	12 × 8 = 96
1 × 9 = 9	1 × 10 = 10	1 × 11 = 11	1 × 12 = 12
2 × 9 = 18	2 × 10 = 20	2 × 11 = 22	2 × 12 = 24
3 × 9 = 27	3 × 10 = 30	3 × 11 = 33	3 × 12 = 36
4 × 9 = 36	4 × 10 = 40	4 × 11 = 44	4 × 12 = 48
5 × 9 = 45	5 × 10 = 50	5 × 11 = 55	5 × 12 = 60
6 × 9 = 54	6 × 10 = 60	6 × 11 = 66	6 × 12 = 72
7 × 9 = 63	7 × 10 = 70	7 × 11 = 77	7 × 12 = 84
8 × 9 = 72	8 × 10 = 80	8 × 11 = 88	8 × 12 = 96
9 × 9 = 81	9 × 10 = 90	9 × 11 = 99	9 × 12 = 108
10 × 9 = 90	10 × 10 = 100	10 × 11 = 110	10 × 12 = 120
11 × 9 = 99	11 × 10 = 110	11 × 11 = 121	11 × 12 = 132
12 × 9 = 108	12 × 10 = 120	12 × 11 = 132	12 × 12 = 144

MULTIPLIERS ENDING IN NAUGHT

1. Annex a naught to the right of 3; then multiply 3 by 10. Is there any difference in the result?

Annexing a naught to the right of a number multiplies it by 10.

2. Multiply by 10: 40; 20; 60; 800; 300; 700; 900.

3. Multiply 3 by 100; 8 by 100; 9 by 100; 20 by 100. How many times greater has each of the numbers become? How many naughts were added to each?

Annexing two naughts to the right of a number multiplies it by 100.

4. Find:

100 × 4
100 × 7
100 × 5
100 × 15
100 × 95
100 × 37
100 × 50
100 × 85
100 × 91
100 × 75
100 × 12
100 × 36

5. What is the difference between 1000 × 3 and 3 × 1000? between 1000 × 6 and 6 × 1000? How many naughts were annexed to 3? to 6? How many times greater has each become?

Annexing three naughts to the right of a number multiplies it by 1000.

6. From what you have learned make a rule for multiplying any number by 10; 100; 1000; 10000.

7. Multiply:

8 by 1000; 7 by 1000; 9 by 1000; 4 by 1000; 13 by 1000; 12 by 10000; 14 by 1000; 19 by 1000; 25 by 100; 36 by 10; 95 by 100; 72 by 10; 72 by 10000.

1. How many cents are there in 100 dimes?

2. How many cents are there in $6?

Find the weight of:

3. 1000 two-pound packages of rolled oats.

4. 1000 five-pound boxes of starch.

5. 25 one hundred-pound kegs of nails.

6. 100 lambs at an average of 45 lb. each.

7. Find the cost of 1000 one-cent postal cards and 100 two-cent stamps.

8. Multiply 63 by 2000.

$$\begin{array}{r} 63 \\ \underline{2000} \\ 126000 \end{array}$$

Write the 2 of the multiplier under the figure in ones' place of the multiplicand. 2 × 63 is 126. Annex three naughts to the right of 126, making 126000. 1000 × 63 = 63000; 2000 × 63 = 126000.

Multiply, and read the product:

9. $\begin{array}{r} 71 \\ \underline{200} \end{array}$

10. $\begin{array}{r} 85 \\ \underline{3000} \end{array}$

11. $\begin{array}{r} 245 \\ \underline{4000} \end{array}$

12. $\begin{array}{r} 715 \\ \underline{700} \end{array}$

13. 347 by 20
14. 409 by 30
15. 715 by 60
16. 329 by 80
17. 475 by 90
18. 293 by 500
19. 786 by 700
20. 184 by 400
21. 796 by 600
22. 832 by 200
23. 481 by 2000
24. 894 by 4000
25. 906 by 7000
26. 728 by 9000
27. 365 by 1200

DIVISORS ENDING IN NAUGHT

1. Divide 60 by 10. Remove 0 from 60. 60 is how many times 6?

2. Compare 40 and 4; 30 and 3; 2 × 10 and 20 ÷ 10. What effect has the removing of naught from the right of a number upon the value of the number?

3. Divide by 10: 20; 900; 350; 470; 530; 260; 740.

4. How many are 100 × 6? 100 × 9? 600 ÷ 100 = ? 900 ÷ 100 = ? How many naughts are removed from the right of 900 when it is divided by 100? from the right of 600? What effect has the removing of two naughts from the right of a number upon the value of the number?

5. Find 1000 × 9; 1000 × 3; 9000 ÷ 1000; 3000 ÷ 1000. How many naughts are removed from the right of 9000 when it is divided by 1000? from the right of 3000? What effect has the removing of three naughts from the right of a number upon the number?

Removing one naught from the right of a number divides the number by 10; *removing two naughts, divides it by* 100; *removing three naughts, divides it by* 1000, *etc.*

Find quotients:

6. 30 ÷ 10
7. 90 ÷ 10
8. 70 ÷ 10
9. 200 ÷ 10
10. 300 ÷ 100
11. 600 ÷ 100
12. 700 ÷ 100
13. 900 ÷ 100
14. 4000 ÷ 100
15. 5000 ÷ 1000
16. 9000 ÷ 1000
17. 7000 ÷ 1000

1. Divide 1460 by 20.

$$\begin{array}{r} 2\cancel{0})\underline{146\cancel{0}} \\ 73 \\ 2\cancel{0}\cancel{0})\underline{146\cancel{0}\cancel{0}} \\ 73 \end{array}$$

Cutting off naught, or the same number of naughts, from *both dividend and divisor* does not change the quotient.

Find the quotients:

2. 80 ÷ 20
3. 60 ÷ 30
4. 90 ÷ 10
5. 40 ÷ 20
6. 900 ÷ 100
7. 1000 ÷ 100
8. 6000 ÷ 200
9. 8400 ÷ 400
10. 12000 ÷ 1000
11. 12000 ÷ 2000
12. 18000 ÷ 3000
13. 16000 ÷ 4000

14. How many 10-gallon cans will a dealer use in shipping 200 gallons of milk?

15. How many 20-lb. packages can be made from 1000 lb. of coffee?

16. 2000 pounds of crackers were shipped in 400 boxes. How many pounds did each box contain?

17. How many $20 coats must be sold to realize $2400?

18. A man bought a house for $3500. How many months will it take to pay for it at $100 a month?

Give quotients at sight:

19. 160 ÷ 40
20. 360 ÷ 30
21. 900 ÷ 90
22. 750 ÷ 30
23. 850 ÷ 50
24. 200 ÷ 50
25. 480 ÷ 80
26. 480 ÷ 60
27. 220 ÷ 110
28. 240 ÷ 120
29. 750 ÷ 15
30. 300 ÷ 60
31. 250 ÷ 25
32. 600 ÷ 50
33. 700 ÷ 140

MULTIPLICATION BY TWO-FIGURE NUMBERS

1. Multiply 64 by 23.

Multiplicand	64	64
Multiplier	23	23
1st partial product	192 = 3 × 64	192
2d partial product	1280 = 20 × 64	128
Entire product	1472 = 23 × 64	1472

In practice the 0 in the second partial product is omitted, and 1280 is written as 128 *tens* by placing the right-hand figure of that product in *tens'* place.

2.	3.	4.	5.
327	203	6004	3060
35	42	73	89
1635	406	18012	27540
981	812	42028	24480
11445	8526	438292	272340

Multiply:

	a	*b*	*c*	*d*	*e*
6.	63	645	863	765	806
	24	32	24	35	43
7.	98	346	609	963	863
	23	54	15	41	51
8.	604	861	867	763	867
	43	32	45	54	36

Multiply:

1. 426 by 23
2. 372 by 41
3. 256 by 33
4. 307 by 32
5. 269 by 43
6. 307 by 27
7. 538 by 36
8. 736 by 63
9. 487 by 52
10. 994 by 35
11. 634 by 37
12. 298 by 73
13. 604 by 48
14. 729 by 40
15. 903 by 86
16. 694 by 79
17. 928 by 89
18. 726 by 75
19. 349 by 28
20. 723 by 14
21. 9006 by 48
22. 2694 by 75
23. 8002 by 38
24. 4293 by 67
25. 9128 by 39
26. 2807 by 74
27. 6293 by 56
28. 4060 by 13
29. 2734 by 27
30. 4169 by 32

31. Announce products at sight:

50 × 90   90 × 70   20 × 80   70 × 60   70 × 40
80 × 70   60 × 50   40 × 30   30 × 30   90 × 90

3 × 3 = 9; 9 is the **square** of 3. 6 × 6 = 36; 36 is the **square** of 6.

To find the **square** *of a number, we multiply it by itself.*

32. Find the squares and memorize:

2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25.

Multiply:

33. 463 by 73
34. 938 by 84
35. 697 by 95
36. 893 by 96
37. 9869 by 84
38. 3278 by 93
39. 9009 by 49
40. 6075 by 74
41. 8693 by 28
42. 9281 by 39
43. 7375 by 47
44. 4069 by 56

MULTIPLICATION OF CONCRETE NUMBERS

Which of the following numbers are *abstract?* Which are *concrete?* Why?

1. 8; 6 days; $4; 5¢; 25; 4 feet; 8 horses.

2. Name the *multiplier* and the *multiplicand* in each problem:

$$\begin{array}{r} \$8 \\ \underline{\times 5} \end{array} \qquad \begin{array}{r} 64 \text{ days} \\ \underline{\times 4 \phantom{\text{ days}}} \end{array} \qquad \begin{array}{r} 81 \text{ horses} \\ \underline{\times 7 \phantom{\text{ horses}}} \end{array} \qquad \begin{array}{r} 72 \text{ oranges} \\ \underline{\times 3 \phantom{\text{ oranges}}} \end{array}$$

3. Observe in each of the above problems that the product must have the *same* name as the multiplicand.

The multiplier is always an abstract number.

4. When two numbers are multiplied, the *number in the product* remains the same in whatever order the numbers are taken; thus: 7 × 12 = 12 × 7.

5. How much do I earn in 125 days at $3 per day?

In problems like this where the multiplier has more figures than the multiplicand, the product of the numbers may be found thus:

$$\begin{array}{r} 125 \\ \underline{3} \\ 375 \end{array}$$

but the analysis of the problem should be given in this way:

I earn in one day, $3.
I earn in 125 days, 125 × $3, or $375.

Find the cost of:

6. 319 days' work @ $3
7. 817 tons coal @ $5
8. 198 lb. meal @ 9¢
9. 345 doz. buttons @ 8¢

How many:

10. Pints in 327 qt.?
11. Inches in 845 ft.?
12. Pecks in 164 bu.?
13. Ounces in 375 lb.?

PRACTICAL PROBLEMS

Find the cost of:

1. 28 pounds of raisins @ 15¢.
2. 46½ gallons of vinegar @ 24¢.
3. 196 pounds of sugar @ 6¢.
4. 48⅓ pounds of butter @ 27¢.
5. 64½ pounds of meat @ 16¢.
6. 85 dozen oranges @ 35¢.
7. 27 gallons of molasses @ 48¢.
8. 58¼ bushels of potatoes @ 60¢.
9. 25 dozen eggs @ 23¢.
10. 54 barrels of flour @ $5.25.
11. 27 barrels of apples @ $2.35.
12. 34 tons of coal @ $6.75.
13. 148½ pounds of tea @ 56¢.
14. 144 dozen eggs @ 26¢.
15. 48 yards of cloth @ 87¢.
16. 36½ tons of hay @ $16.70.

17. The frontage on a city street is 176 feet. How much is it worth at $65 a front foot?

18. A grocer sold 18 firkins of butter, each containing 56 pounds, at 24¢ a pound. How much did he receive for the butter?

19. A boy works 8 hours a day. How many hours does he work in 28¼ days?

COMPARISON

In the following comparisons the first number is to be divided by the second:

1. Compare 12 and 4; 12 and 3; 16 and 4.

2. Compare 5 and 15.

3. Compare:

18 and 6	16 and 4	6 and 12.
20 and 5	45 and 9	6 and 30.

4. When 3 oranges cost 10 cents, how much will 12 oranges cost?

NOTE. — 12 oranges equal 4 × 3 oranges; hence they will cost 4 × 10 cents, or 40 cents.

5. At 6 melons for 25 cents, how much will 24 cost?

6. At 12 lemons for 15 cents, how much will 72 cost?

7. If 8 tons of coal cost $54, how much will 40 tons cost?

8. If 3 collars cost 35 cents, how much will 24 collars cost?

9. When 12 cords of wood cost $48, how much will 3 cords cost?

10. How much will 4 qt. of milk cost when 16 qt. cost $1.28?

11. When 7 tons of hay sell for $91, how much will a farmer receive for 35 tons?

12. If 96 acres of land are worth $2592, how much are 12 acres worth?

REVIEW OF SHORT DIVISION

Answer at sight:

1. 2)32 3)48 4)44 5)35 5)75

2. 6)72 7)147 8)872 9)3699 8)4056

Give answers quickly:

3. $\frac{1}{2}$ of 16; 18; 26; 28; 32; 36; 40.
4. $\frac{1}{3}$ of 24; 27; 36; 18; 60; 90; 120.
5. $\frac{1}{4}$ of 48; 24; 60; 72; 36; 44; 56.
6. $\frac{1}{5}$ of 60; 55; 100; 150; 75; 45; 65.
7. $\frac{1}{6}$ of 72; 96; 84; 24; 48; 240; 36.
8. $\frac{1}{7}$ of 84; 91; 49; 63; 105; 350; 2100.
9. $\frac{1}{8}$ of 96; 72; 640; 960; 560; 120; 880.
10. $\frac{1}{9}$ of 108; 135; 360; 720; 54; 7209; 1080.
11. $\frac{1}{10}$ of 100; 120; 130; 190; 1250; 1950; 1780.
12. $\frac{1}{11}$ of 132; 88; 99; 77; 1100; 1320; 1210.
13. $\frac{1}{12}$ of 144; 288; 96; 84; 960; 840; 1080,

Divide and test:

14. 11)6303 11)2244 11)2882 11)6699

15. 12)96840 12)89640 12)6072 12)9060

Give quotients at sight:

16. 8)96 9)72 10)190 11)121 12)96

LONG DIVISION

1. Divide 240 by 15.

$$\begin{array}{rr l}
 & 16 & \text{Quotient.}\\
\text{Divisor } 15) & \overline{240} & \text{Dividend.}\\
 & \underline{15} & \\
 & 90 & \\
 & \underline{90} & \\
 & 0 &
\end{array}$$

In long division the quotient is placed *over* the dividend. 15 is contained in 24, 1 time. Write the 1 in the quotient over the 4. Multiply 15 by 1, placing the product, 15, under 24. Subtract 15 from 24. The remainder is 9. Bring down the next figure, 0. 15 is contained in 90, 6 times. Multiply 15 by 6, placing the product, 90, under 90. As there is no remainder, the quotient is 16.

Divide:

2.
$$\begin{array}{rr l}
 & 21 & \text{Ans.}\\
13) & \overline{273} & \\
 & \underline{26} & \\
 & 13 & \\
 & \underline{13} &
\end{array}$$

3.
$$\begin{array}{rr l}
 & 23 & \text{Ans.}\\
14) & \overline{322} & \\
 & \underline{28} & \\
 & 42 & \\
 & \underline{42} &
\end{array}$$

4.
$$\begin{array}{rr l}
 & 209 & \text{Ans.}\\
25) & \overline{5225} & \\
 & \underline{50} & \\
 & 225 & \\
 & \underline{225} &
\end{array}$$

5. How many times is 21 contained in 504?

$$\begin{array}{rr}
 & 24\\
21) & \overline{504}\\
 & \underline{42}\\
 & 84\\
 & \underline{84}
\end{array}$$

STEPS:

1. Divide 50 by 21.
2. Write quotient figure.
3. Multiply 21 by 2.
4. Subtract 42 from 50.
5. Bring down next figure.

Test. — 24 × 21 = 504.

6. Divide 441 by 21; 672 by 21; 903 by 21.

FINDING THE QUOTIENT FIGURE IN DIVISION

Think how many times the first figure of the divisor is contained in the first figure of the dividend. The number will be the first figure of the quotient.

1. 252 ÷ 21
2. 525 ÷ 21
3. 861 ÷ 21
4. 714 ÷ 21
5. 651 ÷ 21
6. 357 ÷ 21
7. 504 ÷ 21
8. 2398 ÷ 21
9. 2625 ÷ 21

Think how many times the first figure of the divisor is contained in the first figure, or in the first two figures, of the dividend. The number will be the first figure of the quotient.

10. 713 ÷ 31
11. 899 ÷ 31
12. 6727 ÷ 31
13. 8323 ÷ 41
14. 7061 ÷ 23
15. 9269 ÷ 23
16. 5028 ÷ 42
17. 1344 ÷ 42
18. 6831 ÷ 33
19. 1984 ÷ 32
20. 2272 ÷ 32
21. 1683 ÷ 51

22. Divide 819 by 21.

$$\begin{array}{r} 4 \\ 21\overline{)819} \\ \underline{84} \end{array}$$

Since the product of the divisor and quotient is greater than 81, the quotient figure is *too large*. Try a smaller quotient figure.

$$\begin{array}{r} 39 \\ 21\overline{)819} \\ \underline{63} \\ 189 \\ \underline{189} \end{array}$$

23. Divide 651 by 21.

$$\begin{array}{r} 2 \\ 21\overline{)651} \\ \underline{42} \\ 23 \end{array}$$

Since the remainder is greater than the divisor, the quotient figure is *too small*. Try a larger quotient figure.

$$\begin{array}{r} 31 \\ 21\overline{)651} \\ \underline{63} \\ 21 \\ \underline{21} \end{array}$$

Divide and test:

1. 21)882
2. 21)903
3. 21)504
4. 21)819
5. 21)315
6. 21)567
7. 21)399
8. 21)441
9. 22)814
10. 22)638
11. 22)352
12. 22)660
13. 23)575
14. 23)736
15. 23)966
16. 23)138
17. 31)775
18. 31)744
19. 31)899
20. 31)217
21. 32)672
22. 32)928
23. 32)160
24. 32)192
25. 33)462
26. 33)858
27. 33)561
28. 33)627
29. 41)943
30. 41)2296
31. 41)1107
32. 41)1435
33. 42)1008
34. 42)1596
35. 42)1680
36. 42)1722
37. 43)1333
38. 43)6880
39. 43)9460
40. 43)1376
41. 51)1683
42. 51)3672
43. 51)3264
44. 51)1428
45. 52)1508
46. 52)2288
47. 53)2385
48. 53)1908

49. A butcher paid $1476 for 41 head of cattle. How much was that per head?

50. If a railroad trackman walks 16 miles each day, how long will he be in walking 832 miles?

51. If there are 496 ounces in 31 pounds, how many ounces are there in 1 pound?

52. If 24 barrels of oil cost $44.40, what is the price of 1 barrel?

53. If a bushel of oats weighs 32 lb., how many bushels will weigh 28640 lb.?

54. How long will it take a train that travels 35 miles an hour to go a distance of 315 miles?

55. At 38¢ a word, how many words can I cable from New York to Sweden for $3.04?

LONG DIVISION

1. Divide 7416 by 25.

$$\begin{array}{r l}
 & 296\frac{16}{25} \quad \text{Quotient} \\
25) & \overline{7416} \\
 & \underline{50} \\
 & 241 \\
 & \underline{225} \\
 & 166 \\
 & \underline{150} \\
 & 16 \text{ remainder} \div 25 = \frac{16}{25}.
\end{array}$$

Write the remainder over the divisor, and annex it to the right of the quotient.

Test. — 296 × 25 = 7400; 7400 + 16 = 7416.

Divide and test:

2. 2397 by 51
3. 3888 by 86
4. 1302 by 21
5. 2945 by 38
6. 3213 by 51
7. 1827 by 27
8. 3007 by 36
9. 6256 by 81
10. 5096 by 95
11. 2542 by 41
12. 3567 by 87
13. 1281 by 21
14. 1703 by 27
15. 3034 by 46
16. 4697 by 61
17. 4368 by 98
18. 4544 by 76
19. 2867 by 61
20. 2058 by 27
21. 2668 by 31
22. 3592 by 43
23. 2047 by 83
24. 6938 by 94
25. 7159 by 39
26. 8697 by 28
27. 4910 by 45
28. 3682 by 73
29. 4918 by 94
30. 8168 by 86
31. 7369 by 69
32. 8925 by 28
33. 8010 by 65
34. 9102 by 98

35. How many suits, at $32 each, can be bought for $1095, and what amount will be left?

36. Find the number of barrels of oil, 51 gallons each, that can be filled from a vessel containing 408 gallons.

PRACTICAL PROBLEMS

1. At $.25 each, how many books can you buy for $6.25?

$$\$6.25 = 625\text{¢} \qquad\qquad \$.25 = 25\text{¢}$$

$$\begin{array}{rll}
 & \overline{25} & \text{No. of books.}\\
\text{Cost of 1 book } 25\text{¢} &)625\text{¢}, & \text{money spent.}\\
 & \underline{50} & \\
 & 125 & \\
 & \underline{125} &
\end{array}$$

2. At 16 cents each, how many belts can be bought for $4.80?

3. Mary paid 24 cents a pound for butter. The amount of her bill was $3.12. How many pounds did she buy?

4. How many gallons equal 652 quarts?

5. I bought silk at 75 cents a yard and paid $13.50. How many yards did I buy?

6. In how many months will a man save $1120, if he saves $32 a month? in how many years?

7. How many bars of iron, weighing 56 lb. each, are equal in weight to a bar weighing 18200 lb.?

8. A man sold land for $45 an acre, receiving $7200 for it. How many acres did he sell?

9. An orchard contains 4032 trees, planted in 32 rows. How many trees are there in a row?

10. A farm of 174 acres was sold for $12876. What was the selling price per acre?

DIVISION AND PARTITION

Division is the process of finding how many times one number contains another, or of separating a number into equal parts.

1. How many times is $3 contained in $15?

This problem gives the *size* of the equal parts ($3) into which the dividend ($15) is to be divided, and asks for the *number* of equal parts. $\$15 \div \$3 = 5$, the *number* of equal parts.

2. What is the quotient of $15 divided by 3?

This problem gives the *number* of equal parts (3) into which the dividend ($15) is to be divided, and asks for the *size* of each part. $\frac{1}{3}$ of $\$15 = \$5$, the *size* of each part. This kind of division is called **partition**.

First state whether each problem calls for the *number* of equal parts or the *size* of each part, and then give answers:

3. 144 in. ÷ 12 in.
4. 125 yd. ÷ 5
5. $132 ÷ $11
6. 150 ft. ÷ 10
7. 192 bu. ÷ 16 bu.
8. 108 in. ÷ 9
9. $\frac{1}{10}$ of $250
10. $\frac{1}{8}$ of 128 da.

11. At 45¢ a bushel, how many bushels of corn will sell for $17.55?

12. If 28 Stanhope buggies are sold for $2912, what is the average price?

13. If a train runs 1036 miles in 37 hours, how far will it run in one hour?

REVIEW

Find the cost of:

1. $13\frac{1}{2}$ lb. of butter at 25¢ a lb.
2. 64 suits at $\$8\frac{1}{4}$ each.
3. 32 pairs of shoes at $2 a pair.
4. 400 lb. of sugar at 4¢ a pound.
5. 36 overcoats at $13.25 each.
6. 3000 envelopes at $12 a thousand.
7. 172 yards of cloth at 87¢ a yard.
8. 2500 lb. of coffee at 20¢ a pound.
9. 128 hogs at $\$16\frac{1}{4}$ each.
10. 37 hats at $2.25 each.
11. $45\frac{1}{2}$ yards of silk at 80¢ a yard.
12. 1 gross pencils at 60¢ a dozen.
13. 32 cows at $32 each.
14. 125 tons of hay at $14.75 a ton.
15. 72 bbl. of flour at $5.25 a barrel.
16. 14 bolts of ribbon at 75¢ a bolt.
17. 78 bu. of wheat at 87¢ a bushel.
18. $47\frac{1}{2}$ bu. of oats at 40¢ a bushel.
19. 25 bu. of corn at 50¢ a bushel.
20. 25 lb. of meat at 25¢ a pound.
21. $2\frac{1}{2}$ doz. pairs of gloves at $1 a pair.
22. $36\frac{1}{2}$ yd. of cloth at 18¢ a yard.
23. 2 gross penholders at 50¢ a dozen.

Add:

24. $463.75
695.42
1937.86
947.75
678.93

25. $6937.85
596.27
8346.39
326.42
2186.75
495.38

26. $9612.73
693.85
2928.46
478.74
8569.93
195.84

27. $3762.95
661.43
99.87
875.67
989.86
4987.19

PRACTICAL WORK

MARKET REPORT

Potatoes, 75¢ per bu.
Beans, $1.25 per bu.
Butter, Print, 33¢ per lb.
Dairy, 25¢ per lb.
Sugar, 100 lb. bag, $5.50.
Flour, per bbl., $5.80.

Corn, 45¢ per bu.
Baked beans, 95¢ per doz. cans.
Celery, 25¢ per doz.
Eggplant, 75¢ per doz.
Watercress, 40¢ per doz.
Blackberries, per crate, $3.20.

From the market report find the cost of each of the following:

1. 7 bu. potatoes.
2. 15 lb. print butter.
3. 12 doz. celery.
4. 25 doz. watercress.
5. 5 bu. beans.
6. 12 lb. dairy butter.
7. 8 bu. corn.
8. 10 bags sugar.
9. 25 bbl. flour.
10. 2 doz. cans baked beans.
11. 7 doz. eggplant.
12. 3 crates blackberries.

At $12\frac{1}{2}$¢ each find the cost of:

13. 72 lb. of meat.
14. 144 books.
15. 64 vases.
16. 168 cups.
17. 256 yd. of lawn.
18. 176 cards of buttons.
19. 272 pecks of potatoes.
20. 128 baskets of tomatoes.
21. 96 watermelons.
22. 152 yd. of ribbon.

23. If it is 8 miles from A to B, and $4\frac{1}{2}$ times as far from B to C, how far is it from A to C?

24. James bought 10 lb. of sugar at $5\frac{1}{2}$ cents a pound; $4\frac{1}{2}$ lb. of butter at 20 cents a pound; 6 lemons at 3 for 5 cents; and two 8-cent loaves of bread. He gave the grocer a two-dollar bill. How much change did he receive?

PRACTICAL PROBLEMS

1. A farmer has 28 cows in three fields. If there are 12 in the first, and 9 in the second, how many cows are there in the third field?

2. The farmer values his cows at an average of $ 35 each. What is the value of all?

3. The fields over which they graze contain 24 acres, 18 acres, and 14 acres. How much grazing land is there, and what is the value of this land at $ $35\frac{1}{2}$ an acre?

4. If the farmer receives 21560 gallons of milk a year, how much is it worth at 12 cents a gallon?

5. His Jersey cow yields 350 lb. of butter a year, which he sells at 28 cents a pound. How much does he receive for it?

6. He sold 5 of the cows at an average price of $ 48.50. How much did he receive for them?

7. He keeps 2 men at $ $22\frac{1}{2}$ a month each, to work on the farm. How much does the labor for the year cost?

8. He sold 14 calves for $ 98. How much did he receive, on an average, for each?

9. His grocery bill averaged $ $36\frac{1}{4}$ per month. Find his bill for the year.

10. He purchased 2 horses, one at $ 125, and one at $ 150; and 2 wagons at $ 85 each. Repairs on the farm cost $ 87.50. Find the amount paid.

11. He bought $1\frac{1}{2}$ doz. milk cans at $1.25 each. How much did they cost?

MEASURES OF TIME

1. Write the days of the week and the months of the year, with their abbreviations.

2. Observe that the **second hand** moves over 60 small or second spaces, while the minute hand moves over one minute space.

3. Memorize this table:

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
365 days = 1 year (yr.)

September, November, April, and June have each 30 days. All the others except February have 31 days each. February usually has 28 days. A year that has 366 days is called a **leap year**. In leap year February has 29 days.

4. Memorize this rhyme:

Thirty days have September,
April, June, and November.
All the rest have thirty-one,
Save February, which alone
Has twenty-eight; and one day more
We add to it one year in four.

Change:

5. 3 min. to sec.
6. 6 da. to hours.
7. 7 hr. to minutes.
8. 3 da. 6 hr. to hr.
9. 10 wk. 6 da. to da.

10. How many days are there in April, May, and June? in November, December, and January?

MEASURES OF WEIGHT

1. Name some articles bought by the **ounce** (oz.); by the **pound**.

2. How many ounces are there in 1 pound? in 10 pounds?

Coal, hay, sand, plaster, etc., in large quantities, are sold by the **ton** of 2000 **pounds**.

3. Memorize the table:

16 oz. = 1 pound (lb.)
2000 pounds = 1 ton (T.)

4. A dealer buys 150 bales of hay, averaging 90 pounds to the bale. How many tons and pounds over does he buy?

5. At 3 cents an ounce, how much will 1 pound of mustard cost?

6. Find the cost of six kegs of nails, each keg weighing 100 lb., at $5\frac{1}{2}$ cents a pound.

7. 2 tons of rolled oats were packed in pound packages. How many packages were there?

8. How many ounces are there in a ton?

9. A load of hay weighed 3000 pounds. How many tons did it weigh? What was its value at $ 14 a ton?

MEASURES OF LENGTH OR DISTANCE

1. Name the measures that you have already learned.

2. A foot = —— inches.

3. A yard = —— feet.

4. What measure should you use to measure the length of your book? of your desk? the width of your schoolroom? the length of the blackboard?

5. Measure $5\frac{1}{2}$ yards or $16\frac{1}{2}$ feet along the street or on the school ground. Call it **one rod.**

6. Secure a tape measure $5\frac{1}{2}$ yards long, and with it measure the length and the width of your school grounds in yards and feet.

7. With a pole or a tape, a rod in length, measure the distance in rods and feet around a square or a field.

8. 20 city blocks, each 16 rods in length, are 320 rods long. This is called **one mile.** 1 **mile** = 320 **rods.**

9. $320 \times 16\frac{1}{2}$ ft. = —— feet. (Why do we multiply $16\frac{1}{2}$ ft. by 320?)

10. 5280 ft. ÷ 3 = —— yards. (Why do we divide 5280 ft. by 3?)

11. Memorize this table:

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
$5\frac{1}{2}$ yards, or $16\frac{1}{2}$ feet = 1 rod (rd.)
320 rods = 1 mile (mi.)
1760 yards = 1 mile
5280 feet = 1 mile

MEASURES OF LENGTH OR DISTANCE

Change:

1. 60 ft. to yd.
2. 27 rd. to ft.
3. 16 ft. to in.
4. 42 in. to ft.
5. 320 rd. to ft.
6. 1760 yd. to ft.
7. 5 ft. to in.
8. 120 in. to ft.
9. 72 ft. to yd.
10. 420 in. to ft.
11. 1250 yd. to ft.
12. 120 rd. to ft.

13. How many feet of fence are required for a garden in the form of an oblong 26 yards long and 12 yards wide?

14. James lives 180 rods from the schoolhouse. How many feet does he travel in going to and coming from school each day?

15. A boy travels 135 yards each day in carrying the mail. How many yards does he travel in 6 days? How much less than a mile does he travel?

MEASURES OF SURFACE

1. Draw a square inch. What two things show that it is a *square* inch?

2. Draw on the blackboard one square foot. What two things show that it is a *square* foot?

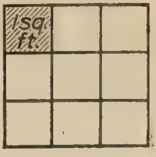
3. Separate each side of a square foot into 12 equal parts. Connect these points by straight lines. What is the size of each square? the name of each square? How many square inches equal one square foot?

144 square inches = 1 square foot

4. Draw on the blackboard a square yard. What two things show that it is a *square* yard?

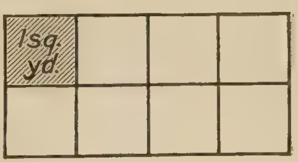
Let one inch represent a foot. How long, then, is the side of the square that represents a square yard?

5. Represent a square yard by a square, each side of which is $\frac{3}{4}$ inch. Then, $\frac{1}{4}$ inch represents 1 foot. How long is each side of a square yard? Measure the surface of the square yard by 1 square foot. How many square feet are there in the upper row? in the second row? in the three rows?



9 sq. ft. = 1 sq. yd.

6. This drawing represents an oblong 4 yards long and 2 yards wide. Measure the surface by 1 square yard. How many square yards are in one row? in both rows?



In 1 row there are 4 sq. yd.

In 2 rows there are 2 × 4 sq. yd. or 8 square yards.

7. How many square yards are there in an oblong 5 yd. long and 4 yd. wide?

The number of square inches, square feet, or square yards a surface contains is called its **area**.

MEASURES OF SURFACE

Find the area in square inches of:

1. An oblong 6 in. by 4 in.
2. A square 7 in. on each side.
3. A page 8 in. by 5 in.
4. A slate 10 in. by 12 in.
5. An 8-in. square.
6. A 12-in. square.
7. A 9-in. square.
8. A 10-in. square.

9. Draw a figure to represent an oblong 5 in. long and 3 in. wide. Find its area. Find the distance around the oblong.

The distance around a figure is called the **perimeter.**

10. Find the perimeter, in inches, of each figure described in problems 1 to 9.

Represent the following figures by a scale of 1 inch to the foot, and find the area and the perimeter:

11. A 6-ft. square.
12. A rug 9 ft. by 4 ft.
13. A wall 9 ft. by 6 ft.
14. A table 6 ft. by 5 ft.

Find the area and the perimeter. Represent on a scale of 1 inch to a yard:

15. A schoolroom 10 yd. long and 8 yd. wide.
16. A hall 15 yd. long and 3 yd. wide.
17. A sidewalk 12 yd. long and 2 yd. wide.
18. Matting for a room 5 yd. long and 4 yd. wide.
19. Measure, in even yards, the length and width of your schoolroom floor, and draw the figure on a scale of 1 in. to the yard; 1 in. to the foot.

READING AND WRITING NUMBERS

1. How are large numbers pointed off before being read?

2. Name the periods of numbers up to millions.

3. Read 2,028,375. Notice that in reading a number the units' period is not named. Thus this number is read 2 *million*, 28 *thousand*, 375; *not* 375 *units.*

The next period after millions is called **billions' period.**

Copy, point off, and read:

	a	*b*	*c*	*d*
4.	2405	30670	6800907	8645742689
5.	3065	49007	400745	750680009
6.	7005	40074	8790007	406009807
7.	8900	87090	4057042	6804704924
8.	6666	90703	3012890	9000000250
9.	3050	65002	7000002	8057000000
10.	9580	73200	9050601	5700809563

Write:

11. Six thousand six hundred six.

12. Two billion ten million four.

13. Seventy-five thousand nine hundred six.

14. One billion eight million seventy-five.

15. Eighty-four million six hundred five thousand.

16. Twenty-five thousand thirty-eight.

17. Nine hundred million nine hundred ninety-nine.

18. Two million six thousand thirty.

19. One billion one million one thousand.

REVIEW

1. Begin with 9 and count by 9's to 126.

2. Begin with 1 and count by 9's to 118.

Add by columns and by lines:

a *b* *c*

3. 42 + 74 + 39 =

4. 36 + 93 + 61 =

5. 27 + 81 + 87 =

6. 49 + 64 + 49 =

7. 38 + 72 + 86 =

+ + =

d *e* *f*

8. 24 + 32 + 65 =

9. 39 + 86 + 92 =

10. 94 + 39 + 19 =

11. 28 + 76 + 85 =

12. 63 + 15 + 84 =

+ + =

a *b* *c* *d*

13. $ 42.35 + $ 24.63 + $ 36.74 + $ 82.95 =

14. 18.69 + 32.78 + 6.27 + 2.39 =

15. 2.41 + 41.65 + .96 + 49.85 =

16. 36.74 + 59.83 + 18.49 + 13.74 =

17. 83.89 + 43.62 + 9.37 + 26.48 =

+ + + =

18. $ 57.35 + $ 75.15 + $ 72.26 + $ 275.25 =

19. 63.27 + 64.23 + 17.83 + 375.65 =

20. 54.86 + 81.37 + 27.64 + 825.45 =

21. 83.74 + 76.45 + 36.21 + 963.75 =

22. 83.64 + 22.68 + 73.56 + 856.87 =

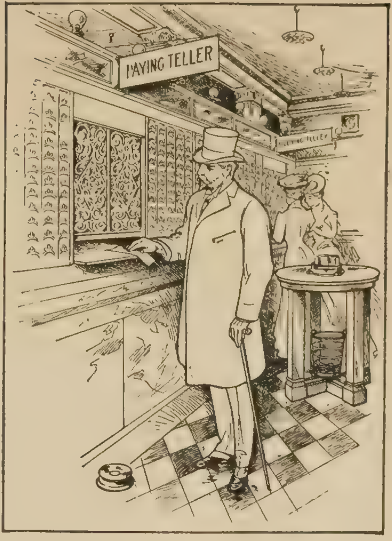
+ + + =

23. From the numbers at the right representing the daily circulation of a paper, find its circulation for July.

23.

2.	2134
3.	2124
4.	2110
5.	2124
6.	2124
7.	2064
9.	2123
10.	2128
11.	2124
12.	2109
13.	2114
14.	2063
16.	2110
17.	2124
18.	2124
19.	2124
20.	2124
21.	2062
23.	2128
24.	2124
25.	2124
26.	2124
27.	2124
28.	2058
30.	2120
31.	2127

BANK DEPOSITS



A bank is an institution that receives and loans money.

1 A bank received deposits as follows:

Monday,	$4126.50;
Tuesday,	$2842.35;
Wednesday,	$5045.60;
Thursday,	$3862.41;
Friday,	$6065.70;
Saturday,	$7564.72.

Find the total deposits for the week.

2. It paid out during the week $24862.43. How much more was received than was paid out?

3. On June 1, F. G. Bishoff had a balance on hand of $4232.44. During the month he deposited $1642.80, and checked on his account to the amount of $2214.60. What was his balance in bank July 1?

Find the balances:

	Deposits	Payments		Deposits	Payments
4.	$216443.62	$111861.74	5.	$15419.21	$14000.00
	112384.76	210987.65		16987.91	9044.89
	211129.82	2940.74		6456.75	1055.20
	114781.64	172.67		14381.50	10105.00
	122046.95	127642.94		3102.62	2056.98
	336847.68	1654.87		10000.00	8401.40

REVIEW OF ADDITION

Add (when written) 4 problems in $1\frac{1}{2}$ minutes:

	a	*b*	*c*	*d*
1.	$751.04	$146.80	$345.75	$187.90
	690.20	12.96	187.60	64.72
	404.72	842.90	962.45	124.87
	812.42	950.45	878.72	671.82
	900.25	2.75	964.54	48.96
	10.48	24.87	12.68	702.84
2.	$964.77	$420.41	$862.41	$864.12
	844.76	703.45	742.87	246.98
	99.75	802.60	368.23	107.64
	184.65	12.87	467.28	963.66
	209.87	908.72	643.82	478.23
	84.72	885.88	782.95	682.87
	104.88	225.12	328.15	478.24
	84.91	380.96	841.62	332.85
3.	$844.62	$10642.83	$321.62	$12891.42
	256.48	469.27	41.68	117.68
	741.87	184.64	769.62	49.64
	369.73	926.48	186.47	961.41
	108.42	12.93	524.93	87.83
	957.68	193.67	834.71	113.22
	87.64	446.72	221.34	487.64
	123.96	689.38	455 26	923.06

REVIEW OF SUBTRACTION

Write, subtract, and test 4 problems in $2\frac{1}{2}$ minutes:

	a	*b*	*c*	*d*
1.	$843.87 632.17	$376.47 248.02	$48892.00 15079.63	$2498.73 519.71
2.	$600.01 289.81	$246.91 19.17	$32171.19 16593.40	$7739.82 7015.09
3.	$940.09 16.41	$1497.63 900.75	$45269.79 27319.27	$9999.86 1305.17
4.	$632.25 245.19	$741.20 523.18	$37461.27 19842.07	$5020.37 2456.78
5.	$95.33 49.27	$61.05 37.97	$649.08 500.16	$27004.49 19017.63
6.	$82.36 19.36	$79.87 27.93	$532.98 403.61	$75009.75 69135.92
7.	$80.16 25.31	$65.32 13.27	$763.55 300.01	$97382.99 39853.75
8.	$67.35 59.32	$51.27 27.75	$983.27 742.19	$32148.91 14269.90
9.	$90.00 37.17	$86.95 14.75	$836.92 775.48	$33197.84 19057.55

DRILL WORK

Multiply and test:

$$\left.\begin{array}{rr}\textbf{1.}&8465\\ \textbf{2.}&7645\\ \textbf{3.}&8741\\ \textbf{4.}&9860\\ \textbf{5.}&8425\\ \textbf{6.}&9654\\ \textbf{7.}&7869\\ \textbf{8.}&9765\\ \textbf{9.}&4875\\ \textbf{10.}&8420\end{array}\right\}\text{ by }\left\{\begin{array}{l}a\ 22\\ b\ 45\\ c\ 50\\ d\ 86\\ e\ 76\\ f\ 98\\ g\ 56\\ h\ 69\\ i\ 97\\ j\ 89\end{array}\right.$$

Form 100 problems by multiplying each multiplicand by each multiplier, as:

$1\,a\quad 22 \times 8465 = ?$

$1\,d\quad 86 \times 8465 = ?$

$6\,e\quad 76 \times 9654 = ?$

11. Divide 969 by 23.

$$\begin{array}{r} 42\frac{3}{23}\\ 23\overline{)969}\\ 92\\ \hline 49\\ 46\\ \hline 3\end{array}$$

Test. — $42 \times 23 = 966$

$966 + 3 = 969$

12. Divide 969 by 24.

$$\begin{array}{r} 40\frac{9}{24}\\ 24\overline{)969}\\ 96\\ \hline 9\end{array}$$

Divide and test:

$$\left.\begin{array}{rr}\textbf{13.}&84765\\ \textbf{14.}&57672\\ \textbf{15.}&80720\\ \textbf{16.}&50724\\ \textbf{17.}&60925\\ \textbf{18.}&86412\\ \textbf{19.}&76412\\ \textbf{20.}&83456\end{array}\right\}\text{ by }\left\{\begin{array}{l}a\ 86\\ b\ 78\\ c\ 91\\ d\ 59\\ e\ 72\\ f\ 67\\ g\ 82\\ h\ 65\end{array}\right.$$

Form 64 problems by dividing each of the dividends by each of the divisors, thus:

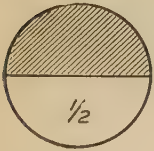
$13\,a\quad 84765 \div 86 = ?$

$13\,c\quad 84765 \div 91 = ?$

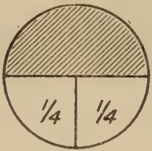
$18\,e\quad 86412 \div 72 = ?$

ADDITION AND SUBTRACTION OF HALVES AND FOURTHS

Halves

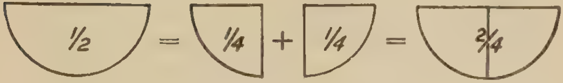


Fourths



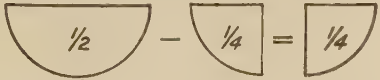
$\frac{2}{2}$ equal one whole unit; $\frac{1}{2}+\frac{1}{2}=\frac{2}{2}$ or 1.

$\frac{4}{4}$ equal one whole unit; $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{4}{4}$ or 1.



$$\frac{1}{2} = \frac{1}{4} + \frac{1}{4} = \frac{2}{4}$$

1. $\frac{1}{2}=\frac{?}{4}$; $\frac{1}{2}+\frac{1}{4}=\frac{?}{4}$; $\frac{1}{2}+\frac{1}{4}+\frac{1}{4}=\frac{?}{4}$.



$$\frac{1}{2} - \frac{1}{4} = \frac{1}{4}$$

2. $\frac{1}{2}-\frac{1}{4}=\frac{?}{4}$; $\frac{3}{4}-\frac{1}{2}=\frac{?}{4}$; $\frac{2}{4}-\frac{1}{2}=\frac{?}{4}$.

First add, then subtract:

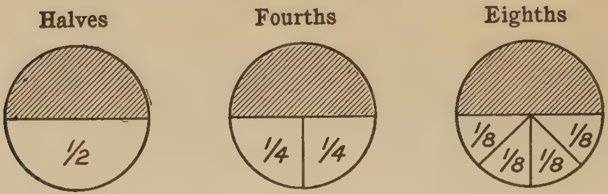
3.	**4.**	**5.**	**6.**	**7.**
$5\frac{1}{2}$	$9\frac{3}{4}$	$9\frac{1}{2}$	$5\frac{1}{4}$	$8\frac{3}{4}$
$3\frac{1}{4}$	$8\frac{1}{2}$	$3\frac{1}{2}$	4	$2\frac{1}{2}$

Add:

8.	**9.**	**10.**	**11.**	**12.**
$3\frac{1}{2}$	$67\frac{1}{4}$	$65\frac{1}{2}$	$25\frac{3}{4}$	$56\frac{1}{4}$
$4\frac{1}{4}$	$6\frac{1}{2}$	$7\frac{3}{4}$	$8\frac{1}{4}$	$7\frac{1}{2}$
$7\frac{3}{4}$	$5\frac{1}{2}$	$9\frac{1}{4}$	$9\frac{3}{4}$	$8\frac{1}{4}$
$15\frac{1}{2}$				

In example 8, $\frac{3}{4}+\frac{1}{4}=\frac{4}{4}$ or 1; $1+\frac{1}{2}=1\frac{1}{2}$. Write the fraction $\frac{1}{2}$ and add the 1 to the whole number.

HALVES, FOURTHS, AND EIGHTHS



$$\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$$

1. $\frac{1}{2} = \frac{?}{4} = \frac{?}{8}$. $\frac{2}{8} + \frac{1}{2} + \frac{1}{4} = \frac{?}{8}$. $\frac{4}{8} - \frac{1}{4} = \frac{?}{8}$.

2. Compare $\frac{1}{2}$ and $\frac{4}{4}$ of the same circle.

3. Compare $\frac{1}{2}$ and $\frac{1}{8}$ of the same circle.

4. $\frac{1}{4}$ is what part of $\frac{1}{2}$? $\frac{4}{8} = \frac{?}{2} = \frac{?}{4}$.

5. $\frac{1}{2} = \frac{?}{8}$; $\frac{1}{4} = \frac{?}{8}$; $\frac{1}{2} + \frac{1}{8} + \frac{1}{4} = \frac{?}{8}$; $\frac{1}{2} - \frac{1}{8} = \frac{?}{8}$.

6. Into how many eighths can the whole circle be divided? into how many fourths?

Add:

7.	8.	9.	10.	11.
$3\frac{1}{2}$	$7\frac{3}{4}$	$6\frac{1}{2}$	$9\frac{1}{8}$	$5\frac{1}{8}$
$3\frac{1}{8}$	$8\frac{1}{2}$	$7\frac{1}{4}$	11	$12\frac{1}{4}$
$4\frac{1}{4}$	$9\frac{1}{2}$	$9\frac{2}{8}$	$6\frac{1}{2}$	$3\frac{1}{2}$

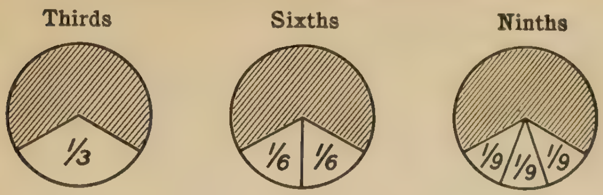
12. $\frac{3}{4} + \frac{2}{4} + \frac{3}{4} = \frac{8}{4}$, or 2 whole units; $\frac{3}{8} + \frac{7}{8} + \frac{6}{8} =$ how many whole units?

Subtract, then add:

13.	14.	15.	16.	17.
$10\frac{3}{8}$	$12\frac{1}{2}$	$27\frac{3}{4}$	$19\frac{1}{4}$	$36\frac{1}{2}$
$5\frac{1}{4}$	$6\frac{1}{8}$	$8\frac{3}{8}$	$6\frac{1}{8}$	$16\frac{3}{8}$

18.	19.	20.	21.	22.
$62\frac{5}{8}$	$63\frac{3}{4}$	$26\frac{3}{4}$	$18\frac{3}{4}$	$40\frac{3}{4}$
$31\frac{3}{8}$	$39\frac{1}{2}$	$24\frac{3}{8}$	$9\frac{3}{8}$	$20\frac{1}{8}$

THIRDS, SIXTHS, AND NINTHS



$\frac{1}{3} = \frac{2}{6} = \frac{3}{9}$

1. $\frac{1}{3} + \frac{3}{9} = \frac{?}{9}$; $\frac{1}{3} + \frac{1}{6} = \frac{?}{6}$.

2. $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{?}{3}$ or — unit; $\frac{1}{3} + \frac{3}{9} = \frac{?}{9}$; $\frac{1}{2} = \frac{?}{6}$; $\frac{1}{2} + \frac{1}{6} = \frac{?}{6}$.

First add and then subtract:

3. $\begin{array}{r} 15\frac{2}{3} \\ \underline{10\frac{2}{9}} \end{array}$
4. $\begin{array}{r} 29\frac{1}{3} \\ \underline{13\frac{1}{6}} \end{array}$
5. $\begin{array}{r} 81\frac{1}{2} \\ \underline{20\frac{1}{6}} \end{array}$
6. $\begin{array}{r} 42\frac{8}{9} \\ \underline{13\frac{1}{3}} \end{array}$

7. $\begin{array}{r} 62\frac{5}{8} \\ \underline{12\frac{1}{4}} \end{array}$
8. $\begin{array}{r} 15\frac{5}{6} \\ \underline{12\frac{2}{3}} \end{array}$
9. $\begin{array}{r} 16\frac{7}{8} \\ \underline{10\frac{1}{4}} \end{array}$
10. $\begin{array}{r} 19\frac{2}{3} \\ \underline{12\frac{1}{6}} \end{array}$

11. Mrs. Clark bought $1\frac{5}{6}$ dozen lemons and used $1\frac{1}{3}$ dozen. How many remained?

12. Henry studies $4\frac{1}{6}$ hours a day, and James $6\frac{1}{3}$ hours. How much longer does James study each day than Henry?

13. A flower bed is $4\frac{1}{3}$ ft. long and $2\frac{2}{3}$ ft. wide. Find the distance around it.

14. If it takes Henry $3\frac{1}{3}$ hours to walk a certain distance, or $1\frac{1}{9}$ hours to ride it on his bicycle, how much time does he save by riding?

MULTIPLICATION

1. Multiply 794 by 326.

$$\begin{array}{r}
694 \\
\underline{326} \\
4164 = 6 \times 694 \\
13880 = 20 \times 694 \\
\underline{208200} = \underline{300} \times 694 \\
226244 = 326 \times 694
\end{array}
\qquad\qquad
\begin{array}{r}
694 \\
\underline{326} \\
4164 \\
1388 \\
\underline{2082} \\
226244
\end{array}$$

When multiplying by 3 hundreds, write the partial product as 2082 *hundreds* by placing the first figure of that product under *hundreds*.

Multiply:

2.	**3.**	**4.**	**5.**
462	283	619	543
375	243	128	264

6.	**7.**	**8.**	**9.**
$ 40.75	$ 26.73	$ 38.27	$ 46.75
325	364	918	842

10. 465 by 327
11. 289 by 943
12. 568 by 769
13. 987 by 938
14. 478 by 783
15. 925 by 867
16. 387 by 591
17. 5382 by 147
18. 2493 by 316
19. 9875 by 827
20. 7341 by 695
21. 9386 by 783
22. 6294 by 894
23. 9387 by 619
24. $ 46.75 by 275
25. $ 83.94 by 843
26. $ 76.15 by 972
27. $ 39.85 by 867
28. $ 48.57 by 984
29. $ 96.78 by 786
30. $ 39.74 by 815

31. Announce products at sight:

20 × 40 50 × 50 12 × 12 80 × 80

MULTIPLICATION

1. Multiply 273 by 304.

$$\begin{array}{r} 273\\ 304\\ \hline 1092\\ 000\\ 819\\ \hline 82992 \end{array} \qquad\qquad \begin{array}{r} 273\\ 304\\ \hline 1092\\ 819\\ \hline 82992 \end{array}$$

Do not multiply by 0 as in the first illustration. When multiplying by 3 hundreds, write the partial product as 819 *hundreds* by placing the right hand figure of that product in *hundreds'* place.

2.
$$\begin{array}{r} 402\\ \times 503\\ \hline 1206\\ 2010\\ \hline 202206 \end{array}$$

3.
$$\begin{array}{r} \$30.60\\ \times 2040\\ \hline 122400\\ 6120\\ \hline \$62424.00 \end{array}$$

4.
$$\begin{array}{r} \$20.75\\ \times 105\\ \hline 10375\\ 2075\\ \hline \$2178.75 \end{array}$$

5. $\begin{array}{r} 316\\ \times 502\\ \hline \end{array}$ **6.** $\begin{array}{r} 275\\ \times 306\\ \hline \end{array}$ **7.** $\begin{array}{r} 428\\ \times 405\\ \hline \end{array}$ **8.** $\begin{array}{r} 506\\ \times 307\\ \hline \end{array}$

9. $\begin{array}{r} 243\\ \times 308\\ \hline \end{array}$ **10.** $\begin{array}{r} 709\\ \times 504\\ \hline \end{array}$ **11.** $\begin{array}{r} 608\\ \times 209\\ \hline \end{array}$ **12.** $\begin{array}{r} 705\\ \times 804\\ \hline \end{array}$

13. $\begin{array}{r} \$8.08\\ \times 607\\ \hline \end{array}$ **14.** $\begin{array}{r} \$40.75\\ \times 603\\ \hline \end{array}$ **15.** $\begin{array}{r} \$90.70\\ \times 504\\ \hline \end{array}$ **16.** $\begin{array}{r} \$38.04\\ \times 703\\ \hline \end{array}$

How many are:

1. 704 × 3096
2. 809 × 9409
3. 609 × 7320
4. 507 × 8060
5. 608 × 3724
6. 309 × 4039
7. 907 × 7008
8. 408 × 6007
9. 502 × 9103
10. 903 × 7030
11. 803 × $ 40.70
12. 709 × $ 75.25
13. 304 × $ 68.07
14. 508 × $ 70.95
15. 806 × $ 48.57

Multiply:

16. 8945 by 643
17. 3089 by 136
18. 4506 by 275
19. 3875 by 609
20. 5783 by 382
21. 3296 by 907
22. 7395 by 834
23. 3837 by 958
24. 6574 by 687
25. 8936 by 706
26. 6785 by 904
27. 7856 by 685
28. 9786 by 607
29. 7869 by 783
30. 6778 by 579
31. 9868 by 632
32. 5846 by 597
33. 6484 by 460
34. 9676 by 329
35. 6798 by 376
36. 5078 by 206
37. 9067 by 508
38. 8906 by 379
39. 6709 by 806
40. 6076 by 927
41. 8405 by 403
42. 6035 by 876
43. 8708 by 804
44. 7083 by 705
45. 5067 by 770

46. Mr. Watson had 2475 boxes of soap. Each contained 175 cakes. Find the entire number of cakes.

47. A factory averages 2485 articles for 310 days of the year. What is the entire number made?

48. Mrs. Thompson raised 246 turkeys and sold them at $ 1.75 each. How much did she receive for them?

49. A suit factory manufactured 3685 suits during the season. At $ 28.50 each, how much was received for them?

PARTS OF NUMBERS

1. Find $\frac{2}{3}$ of 24.

$\frac{1}{3}$ of 24 is 8;
$\frac{2}{3}$ of $24 = 2 \times 8$, or 16.

How do we find $\frac{1}{3}$ of a number? $\frac{1}{4}$ of a number? $\frac{1}{8}$ of a number, etc.? $\frac{2}{3}$ of a number $= 2 \times \frac{1}{3}$ of the number. $\frac{3}{5}$ of a number $= 3 \times \frac{1}{5}$ of the number, etc.

Give rapidly.

2. $\frac{1}{2}$ of each number: 16, 24, 36, 44, 48, 50.

3. $\frac{1}{3}$ and $\frac{2}{3}$ of each number: 15, 18, 24, 36, 45.

4. $\frac{1}{4}$ and $\frac{3}{4}$ of each number: 16, 20, 28, 32, 48.

5. $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$, and $\frac{4}{5}$ of each number: 20, 35, 45, 40, 80.

Find:

6. $\frac{1}{3}$ of 18
7. $\frac{1}{3}$ of 24
8. $\frac{1}{2}$ of 16
9. $\frac{1}{2}$ of 42
10. $\frac{2}{3}$ of 24
11. $\frac{3}{5}$ of 25
12. $\frac{2}{3}$ of 18
13. $\frac{3}{4}$ of 28
14. $\frac{1}{7}$ of 56
15. $\frac{1}{8}$ of 64
16. $\frac{1}{9}$ of 63
17. $\frac{2}{3}$ of 63
18. $\frac{2}{3}$ of 21
19. $\frac{3}{4}$ of 20
20. $\frac{2}{5}$ of 40
21. $\frac{7}{8}$ of 24
22. $\frac{2}{5}$ of 65
23. $\frac{5}{6}$ of 48
24. $\frac{2}{3}$ of 75
25. $\frac{2}{5}$ of 75
26. $\frac{3}{4}$ of 96
27. $\frac{1}{2}$ of 144
28. $\frac{3}{5}$ of 160
29. $\frac{4}{5}$ of 255

Find:

30. $\frac{2}{3}$ of \$24
31. $\frac{3}{4}$ of \$16
32. $\frac{1}{2}$ of \$50
33. $\frac{2}{3}$ of \$18
34. $\frac{3}{4}$ of \$20
35. $\frac{3}{4}$ of 12 lb.
36. $\frac{2}{3}$ of 9 ft.
37. $\frac{1}{3}$ of 12 yd.
38. $\frac{3}{4}$ of 16 gal.
39. $\frac{2}{4}$ of 8 bu.
40. $\frac{1}{2}$ of \$8.20
41. $\frac{1}{3}$ of \$12.60
42. $\frac{1}{4}$ of \$20.40
43. $\frac{1}{3}$ of \$15.90
44. $\frac{1}{4}$ of \$24.20

MULTIPLICATION BY MIXED NUMBERS

1. Multiply 36 by $6\frac{2}{3}$.

$$\begin{array}{r}
36 \\
\underline{6\frac{2}{3}} \\
24 = \frac{2}{3} \text{ of } 36 \\
216 = 6 \phantom{\frac{2}{3}} \times 36 \\
\hline
240 = 6\frac{2}{3} \times 36
\end{array}$$

$6\frac{2}{3} \times 36$, means that $\frac{2}{3}$ of 36 is to be added to 6×36.

Multiply:

2. 72 by $8\frac{3}{4}$
3. 126 by $9\frac{2}{3}$
4. 324 by $12\frac{1}{2}$
5. 872 by $25\frac{3}{4}$
6. 966 by $124\frac{2}{3}$
7. 848 by $238\frac{3}{4}$
8. 489 by $372\frac{1}{2}$
9. 1248 by $309\frac{3}{4}$
10. 2530 by $842\frac{2}{5}$
11. 3575 by $909\frac{2}{5}$
12. 8496 by $890\frac{3}{4}$
13. 3660 by $780\frac{2}{3}$
14. 8575 by $197\frac{1}{5}$
15. 8496 by $875\frac{3}{4}$
16. 9639 by $976\frac{2}{3}$
17. 8472 by $865\frac{3}{4}$
18. 8436 by $345\frac{1}{4}$
19. 9764 by $876\frac{1}{2}$
20. 9972 by $984\frac{2}{3}$
21. 8848 by $787\frac{3}{4}$
22. 7266 by $719\frac{2}{3}$
23. 8755 by $394\frac{3}{5}$
24. 9875 by $485\frac{2}{5}$
25. 9672 by $872\frac{2}{3}$
26. 6488 by $797\frac{3}{4}$
27. 7465 by $864\frac{2}{5}$
28. 7280 by $620\frac{1}{4}$
29. 4860 by $701\frac{3}{4}$
30. 5050 by $500\frac{2}{5}$
31. 6006 by $303\frac{2}{3}$
32. 9608 by $490\frac{3}{4}$
33. 8570 by $809\frac{3}{5}$
34. 6099 by $789\frac{2}{3}$
35. 7085 by $804\frac{2}{5}$

FRACTIONAL PARTS OF A DOLLAR

$\$.50 = \frac{1}{2}$ of $\$1.00$
$\$.25 = \frac{1}{4}$ of $\$1.00$
$\$.20 = \frac{1}{5}$ of $\$1.00$
$\$.10 = \frac{1}{10}$ of $\$1.00$
$\$.40 = \frac{2}{5}$ of $\$1.00$

$\$\,12\frac{1}{2} = \frac{1}{8}$ of $\$1.00$
$\$.06\frac{1}{4} = \frac{1}{16}$ of $\$1.00$
$\$.33\frac{1}{3} = \frac{1}{3}$ of $\$1.00$
$\$.16\frac{2}{3} = \frac{1}{6}$ of $\$1.00$
$\$.75 = \frac{3}{4}$ of $\$1.00$

Give at sight the cost of:

1. 6 bushels of apples at $.50 a bushel.

HINT — $6 \times \$\frac{1}{2} = \$\frac{6}{2} = \$3$

2. 8 gallons of vinegar at $.25 a gallon.
3. 8 yards of silk at $.50 a yard.
4. 8 pounds of meat at $\$.12\frac{1}{2}$ a pound.
5. 10 dozen eggs at $.20 a dozen.
6. 9 yards of muslin at $.10 a yard.
7. 6 pecks of pears at $.25 a peck.
8. 12 pictures at $.75 each.
9. 10 yards of lawn at $.10 a yard.
10. 6 gallons of vinegar at $.50 a gallon.
11. 8 gallons of oil at $.25 a gallon.
12. 12 dozen oranges at $.25 a dozen.
13. 6 bushels of apples at $.50 a bushel.
14. 16 pounds of rice at $\$.12\frac{1}{2}$ a pound.
15. 10 pecks of peaches at $.20 a peck.
16. 8 gallons of milk at $\$.12\frac{1}{2}$ a gallon.

DIVISION

Give quotients at sight:

	a	*b*	*c*	*d*
1.	100 ÷ 10	280 ÷ 140	993 ÷ 331	315 ÷ 105
2.	500 ÷ 50	930 ÷ 310	645 ÷ 129	972 ÷ 324
3.	300 ÷ 30	860 ÷ 172	951 ÷ 317	725 ÷ 145
4.	250 ÷ 50	396 ÷ 132	284 ÷ 142	932 ÷ 466
5.	400 ÷ 80	960 ÷ 320	788 ÷ 197	260 ÷ 130
6.	844 ÷ 211	990 ÷ 330	882 ÷ 126	775 ÷ 155

7. Divide 175608 by 324.

$$\begin{array}{r} 542 \\ 324\overline{)175608} \\ \underline{1620} \\ 1360 \\ \underline{1296} \\ 648 \\ \underline{648} \end{array}$$

8. Divide 793320 by 264.

$$\begin{array}{r} 3005 \\ 264\overline{)793320} \\ \underline{792} \\ 1320 \\ \underline{1320} \end{array}$$

Since 264 is larger than 13, what do we write in the quotient?

Divide:

	a	*b*	*c*
9.	63596 by 126	46785 by 135	13940 by 340
10.	78563 by 341	78568 by 244	81282 by 408
11.	48842 by 144	65375 by 255	23674 by 726
12.	26786 by 354	78634 by 184	83765 by 415
13.	46785 by 165	79673 by 263	27854 by 129
14.	83761 by 219	86572 by 196	76348 by 366

PROBLEMS OF TWO OPERATIONS

1. A dairyman has 137 cows in one herd and 47 less in another. How many cows has he?

137	No. cows in one herd.
47	No. less in 2d herd.
90	No. cows in 2d herd.

137 cows + 90 cows = 227 cows.

Study of Problem

1. What is given in this problem?
   - *a.* The number of cows in one herd.
   - *b.* The difference in the number in the two herds.
2. What is required in the problem?
   - *a.* The number in the second herd.
   - *b.* The number in both herds.
3. How can you find what is required from what is given?
   - *a.* By subtracting the difference from the number in the first herd.
   - *b.* By adding the number of cows in the two herds.

NOTE. — The purpose of these studies is threefold:

1. To train the pupil to see and understand the conditions of the problem.
2. To give a logical grasp of the conditions of the problem.
3. To direct the teacher in his efforts to attain these ends.

2. A man has 267 sheep in one field and 88 less in another. How many sheep has he?

3. A merchant has $496 in the safe and $175.25 less in the bank. How much money has he in both places?

4. A man sold a farm for $7625 and gained $1685. How much would he have received for it if the gain had been $2675?

5. A man's salary is $950 per year. He pays $260 for board, $136 for clothing, and $115.75 for other expenses. How much has he left?

6. A grocer deposited in bank during the week the following sums: $495.65, $283.75, $693.29, $75.80, $249.89, and $375.77. After making the last deposit, he found there was a balance to his credit of $1265.15. How much had he withdrawn?

7. If a freight car costs $475, and a locomotive $14625, what is the value of a train containing 27 cars and a locomotive?

8. A woman sold at a store 16 doz. eggs at 18¢ a dozen, $13\frac{1}{4}$ lb. of butter at 28¢ a pound, and 27 lb. of dressed chicken at 16¢ a pound. How much did she receive for all?

9. A lady bought at a store:

8 lb. of coffee @ 28¢;
$9\frac{1}{2}$ lb. of rice @ 8¢;
24 lb. of sugar @ 5¢;
8 cans tomatoes @ 13¢;
20 cans beans @ 19¢.

Find the amount of her purchases.

10. Find the cost of:

$27\frac{1}{2}$ lb. of cheese @ 18¢;
$14\frac{3}{4}$ lb. of lard @ 12¢;
17 lb. of butter @ 27¢;
25 bottles ammonia @ 8¢;
12 cans peas @ 18¢.

11. A man earned each day in one week as follows: \$2.75, \$3.65, \$4.75, \$6.75, \$1.75, \$12.75. Find his average daily earnings.

$$\begin{array}{r l}
\$\ 2.75 & \\
3.65 & \\
4.75 & \\
6.75 & \\
1.75 & \\
12.75 & \\
\hline
6\overline{)\$32.40} & \text{in 6 days.} \\
\$5.40 & \text{average each day.}
\end{array}$$

Study of Problem

1. What is given in this problem?
2. What is required?
3. What is the first step in the solution? the second?
4. Why do you divide by 6 to find the average?
5. Show that the answer is correct.

12. Two men contribute equal amounts to buy a lot for \$875; to build a storeroom for \$4860; for furniture, \$520; and for goods to begin business, \$5785. How much does each pay?

13. A creamery received milk for six days as follows: 7640 gallons, 8675 gallons, 9634 gallons, 8432 gallons, 8763 gallons, and 8604 gallons. What were the average daily receipts?

14. If Helen received 85 in arithmetic, 79 in grammar, 89 in history, 92 in geography, 86 in physiology, and 85 in writing, what was her average in these studies?

15. The attendance at a school was 604 on Monday, 607 on Tuesday, 598 on Wednesday, 603 on Thursday, 598 on Friday. What was the average daily attendance for the week?

16. 39 ladies' suits, each requiring 12 yards, were made from a lot of cloth containing 576 yards. How many yards were left?

$$\begin{array}{rl} 12 & \text{yd. in 1 suit.} \\ \underline{39} & \text{number of suits.} \\ 108 & \\ \underline{36} & \\ 468 & \text{yd. in 39 suits.} \end{array}$$

576 yd. – 468 yd. = 108 yd.

Study of Problem

1. State this problem in another way.
2. What operation is employed in the first step in the solution? in the second?
3. Prove that the answer is correct.

17. A boy sold 16 books at 20 cents each, and 36 toys at 26 cents each. How much more did he receive for the toys than for the books?

18. Mr. Boyd's mail route is $23\frac{1}{2}$ miles, and Mr. Burton's is $17\frac{1}{4}$ miles. How much farther does Mr. Boyd travel in 84 days than Mr. Burton?

19. A school term is 180 days. If James attends $\frac{4}{5}$ of the term, how many days is he absent from school?

20. A bookkeeper receives $150 a month, and saves $68 a month. How much does he spend in a year?

21. Harry works $48\frac{1}{2}$ hours after school each month, at 12 cents per hour, and Henry $52\frac{3}{4}$ hours at 16 cents per hour. Find the difference in their wages.

22. What is the difference between the cost of 17 horses at $156 each, and 69 cows at $37 each?

23. A merchant buys 28 bbl. of sugar at $23 a barrel, and 36 bbl. at $24 a barrel. If he sells all for $1856, how much does he gain?

24. A merchant paid $420.48 for carpet, and sold it for $569.40. If he gained 17¢ on each yard, how many yards did he buy?

$569.40 selling price of all.
420.48 cost price of all.
$148.92 gain of all.

Gain on
1 yd. $.17)$148.92 gain on all.
876 times, or yd.

Study of Problem

1. What do you mean by the term "cost"?
2. What do you mean by "selling price"? by "gain"?
3. How do you find the total gain?
4. Prove that the answer is correct.

25. I bought land for $1850, and sold it for $2294, thereby gaining $6 an acre. How many acres did I buy?

26. A drover bought cows for $1500, and sold them for $2250. If he gained $15 on each, how many did he buy?

27. Mr. Kinney paid $2640 for a city lot, and sold it for $4560. If he gained $24 a front foot, how many front feet did he sell?

28. The population of a town was 8675 in 1900, and 12635 by a special census taken in 1905. What was the average yearly increase?

29. Mr. Beggs paid $288 rent last year. This year he pays $36 less. What is his rent per month?

30. A jeweler bought rings for $140 and sold them for $160. If he gained $.50 on each, how many did he buy?

31. A laborer worked 16 days at $1.60 a day, and with his earnings bought potatoes at 64¢ a bushel. How many bushels did he receive?

$1.60 daily wages.
16 number of days worked.
9 60
16 0
$25.60 total wages.

Price of 40 times, or bushels.
1 bu. $.64)$25.60 total wages.

Study of Problem

1. State this problem in another way.
2. How can we find the total amount earned?
3. What operation is involved in the first step of the solution? in the second step?
4. Prove that the answer is correct.

32. If 124 bags of coffee, each weighing 48 lb., were bought for $729.12, what was the price per pound?

33. At 20¢ per hour how long will it take a laborer to earn $80, working 8 hours per day?

34. If 96 bu. of corn sell for $60.48, what is the value of 250 bushels at the same price?

35. A trackman averages 2 miles per hour for 8 hours each day. His record book shows 960 miles walked. Find the number of days.

36. If a dozen lemons cost $.36, how much will 840 lemons cost?

37. If 25 bbl. of flour weigh 4900 lb., how much will 56 bbl. weigh?

38. If 23 carriages cost $4025, how much are 84 such carriages worth?

39. If 600 bu. of shelled corn weigh 33,600 lb., how much will 468 bu. weigh?

40. When 9 bales of cotton, weighing 325 lb. each, sell for $731.25, what is the price per pound?

41. If a peach basket holds 2 pecks, how many bushels are there in 12 carloads, each containing 456 baskets?

42. How many books each 2 inches thick can be placed in a bookcase containing 4 shelves, each shelf of which is 3 ft. in length?

43. If 123 tons of coal cost $725.70, how much will 16 tons cost?

44. 24 cords of wood cost $90; how much will 18 cords cost at the same rate?

45. If a newsboy earns $19.98 in 18 days, how much will he earn at the same rate in 360 days?

46. When 525 gallons of milk sell for $84, for how much will 715 sell?

47. Mary bought 16 pounds of coffee at 14¢ a pound, 8 lb. of butter at 28¢ a pound, and 12 cans of corn at 15¢ a can. She gave the merchant in payment a $10 bill. How much change should she receive?

48. A drover sold 56 sheep at $4 each, 8 cows at $36 each, and 48 hogs at $12 each. If he received $275 on the day of the sale, how much is still due him?

49. A lady had $100. If she bought 4 chairs at $6 each, a couch for $28, and a rocking chair for $16, how much had she left?

50. I bought 57 yards of cloth at 25¢ a yard, and 16 yards of matting at 28¢ a yard. Find the cost of both.

51. A lady sold 6 doz. eggs at 18 cents a dozen, and 8 lb. of butter at 27 cents a pound. How much did she receive for both?

52. A merchant bought 546 bbl. of pork at $16.25 a barrel, and sold it so as to gain $1638. At what price per barrel did he sell the pork?

53. James earned $1.50 per day and saved 85 cents. If his savings were $33.15, how many days did he work?

54. A farmer bought 4 horses at $137 each, 7 cows at $27 each, and 38 sheep at $6.50 each. Find the cost of all.

55. What will be the cost of 108 lb. of ham at $16\frac{1}{2}$ cents a pound, and 48 lb. of breakfast bacon at 18 cents a pound?

56. Two automobile parties travel in opposite directions, one at an average of 127 miles, the other at 78 miles a day. How far apart will they be in 16 days?

57. A factory employs 56 men at $1.75 a day, and 12 men at $2.25 a day. Other expenses are $125 a day. How much does it cost to run the factory 26 days?

58. A man paid $165 for a carriage, and $3\frac{2}{5}$ times as much for a span of horses. How much did he pay for both?

59. Mr. Hall deposited in the bank $24 a month for 8 months, and $27 a month for 4 months. How much did he deposit in the year?

REVIEW OF DIVISION

Divide and test:

1. 84563 by 224
2. 45675 by 125
3. 46752 by 236
4. 84252 by 342
5. 78654 by 375
6. 98740 by 425
7. 97601 by 438
8. 98700 by 508
9. 80070 by 710
10. 81704 by 508
11. 99999 by 999
12. 50321 by 637
13. 95846 by 675
14. 37846 by 332
15. 92846 by 124
16. 45983 by 475
17. 32841 by 243
18. 92384 by 752
19. 66008 by 300
20. 15899 by 122
21. 77443 by 224
22. 59823 by 525
23. 78912 by 640
24. 93408 by 825

Find quotients and test:

25. 136425 ÷ 405
26. 246840 ÷ 476
27. 332468 ÷ 332
28. 948562 ÷ 450
29. 476352 ÷ 221
30. 789324 ÷ 552
31. 569239 ÷ 334
32. 159909 ÷ 115
33. 550550 ÷ 155
34. 889034 ÷ 324
35. 604325 ÷ 304
36. 708546 ÷ 222
37. 125745 ÷ 125
38. 985432 ÷ 112
39. 756342 ÷ 102
40. 354725 ÷ 256
41. 498075 ÷ 401
42. 987260 ÷ 200
43. 800745 ÷ 310
44. 584972 ÷ 226

COMBINING PROCESSES

1. $6 + 4 + 8 - 7 + 4 - 9 = ?$
2. $7 + 6 - 5 - 4 + 9 - 6 = ?$

The **parenthesis** ( ) indicates that all numbers inclosed by it are to be considered as one number; thus, $(7 + 9) - (4 + 5)$ means that the sum of 4 and 5 is to be taken from the sum of 7 and 9.

The **vinculum** (——) is sometimes used instead of the parenthesis; thus, $\overline{7 + 9} - \overline{4 + 5} = 7$.

Solve:

3. $9 + 8 - (6 + 6) + 7 - 3 = ?$
4. $8 + 6 + 16 - 7 - 8 + 6 = ?$
5. $26 + 38 - (48 - 23) + 16 = ?$
6. $87 - 42 + \overline{96 - 72} + 26 = ?$
7. $(97 - 35) - \overline{26 + 14} + 78 = ?$
8. $\overline{86 - 48} + 56 - 28 - 47 = ?$

COUNTING BY MIXED NUMBERS

1. Count by $2\frac{1}{2}$ to 40; by $3\frac{1}{3}$ to 40; by $6\frac{1}{4}$ to 50.
2. Announce at sight:

$1\frac{1}{2} \times 4$
$2\frac{1}{2} \times 4$
$3\frac{1}{2} \times 4$
$4\frac{1}{2} \times 4$

$1\frac{1}{2} \times 6$
$2\frac{1}{2} \times 6$
$3\frac{1}{2} \times 6$
$4\frac{1}{2} \times 6$

$1\frac{1}{3} \times 6$
$2\frac{1}{3} \times 6$
$3\frac{1}{3} \times 6$
$4\frac{1}{3} \times 6$

$1\frac{1}{4} \times 4$
$2\frac{1}{4} \times 4$
$3\frac{1}{4} \times 4$
$4\frac{1}{4} \times 4$

3. Build similar tables with $1\frac{2}{3}$, $1\frac{3}{4}$, and $1\frac{2}{5}$.

ANALYSIS

1. Find the cost of 3 doz. oranges at 20¢ per dozen.

1 doz. oranges cost 20¢; 3 doz. cost 3 times 20¢ = 60¢.

2. At 12 cents a quart for berries, how much will 8 quarts cost?

3. At 30¢ a peck, how much will a bushel of beans cost?

4. When peaches are 50 cents a basket, how much will 7 baskets cost?

5. A ton of coal costs $5. How much will 9 tons cost?

6. A boy rides his wheel 6 miles in one hour. How far will he ride in 7 hours?

7. When 5 boxes of matches cost 50¢, how much will 1 box cost?

Cost of 5 boxes = 50¢;
Cost of 1 box = $\frac{1}{5}$ of 50¢, or 10¢.

8. A boy bought 4 balls for 80 cents. How much was that apiece?

9. When 8 yards of velvet cost $24, how much will 1 yard cost?

10. A box of shoes containing 12 pairs costs $36. Find the cost per pair.

11. Six cows were sold for $246. What was the average selling price?

12. When a telegram of 10 words costs 40 cents, what is the average cost of each word?

ANALYSIS

1. When 1 pencil costs 10 ¢, how many can you buy for 60 ¢?

When 1 pencil costs 10 ¢, for 60 ¢ you can buy as many pencils as 10 ¢ is contained in 60 ¢.

2. At 12 ¢ per yard, how many yards of ribbon can be bought for 96 ¢?

3. Cherries are 8 ¢ a quart. How many quarts can be bought for 72 ¢?

4. When 3 tons of coal cost $18, how much will 7 tons cost?

Cost of 3 tons = $18;
Cost of 1 ton = $\frac{1}{3}$ of $18, or $6;
Cost of 7 tons = 7 × $6, or $42.

5. How much will 9 dozen lemons cost when 3 dozen sell for 45 cents?

6. Three men earn $30 in a certain time. How much will 8 men earn in the same time?

7. When $\frac{1}{2}$ a bushel of potatoes sells for 25 cents, how much will 3 bushels cost?

Cost of $\frac{1}{2}$ bu. = 25 ¢;
Cost of 1 bu. = 2 × 25 ¢, or 50 ¢;
Cost of 3 bu. = 3 × 50 ¢, or $1.50.

8. At 20 cents a peck, how much will 2 bushels of apples cost?

9. When milk is selling at 5 ¢ a quart, how much will 3 gallons cost?

10. If $\frac{1}{4}$ of a yard of velvet costs 60 ¢, how much will 2 yards cost?

COMPARISON

1. Compare 80 and 20; 60 and 30; 90 and 10.

2. $2\frac{1}{2}$ is what part of 5? of 10? of 15? of 20?

3. $3\frac{1}{3}$ is what part of 10? of 20? of 30? of $6\frac{2}{3}$?

4. Compare $\frac{9}{10}$ and $\frac{3}{10}$; $\frac{8}{10}$ and $\frac{4}{10}$; $\frac{10}{10}$ and $\frac{5}{10}$.

5. What part of 25 is 5? is $6\frac{1}{4}$? is $2\frac{1}{2}$? is $8\frac{1}{3}$?

6. What part of 6 pk. is 2 pk.? of 10 gal. is 2 gal.?

7. 3 pk. is what part of $1\frac{1}{2}$ bu.? of $2\frac{1}{4}$ bu.?

8. 8 oz. of butter is what part of 2 lb.? of $2\frac{1}{2}$ lb.?

9. When $2\frac{1}{4}$ pounds of butter cost 90 cents, how much will 9 pounds cost?

9 pounds equal $4 \times 2\frac{1}{4}$ pounds; hence, 9 pounds will cost 4×90 cents, or $3.60.

10. If $\frac{1}{2}$ a ton of hay costs $7.50, how much will 4 tons cost?

11. When 2 pecks of potatoes cost 50 cents, how much will $1\frac{1}{2}$ bushels cost?

12. When butter is selling at 3 pounds for $\$\frac{1}{2}$, how much will 15 pounds cost?

13. When $2\frac{1}{2}$ dozen buttons sell for 30 cents, how much will $7\frac{1}{2}$ dozen cost?

14. If $6\frac{1}{4}$ tons of coal cost $37.50, how much will 25 tons cost?

15. If $7\frac{1}{2}$ yards of velvet cost $11.40, how much will 15 yards cost? How many yards can be bought for $22.80?

16. A boy picked 18 quarts of chestnuts and sold them at the rate of 2 quarts for 25 cents. How much did he receive for them?

17. If 3 pounds of steak cost 48 cents, how much will 10 pounds cost?

18. A farmer raised 40 bushels of shelled corn on $7\frac{1}{2}$ acres. At the same rate, how many bushels would he raise on $22\frac{1}{2}$ acres?

Find the cost of:

19. 288 chairs, when 9 chairs cost $ 6.75.

20. 350 rings, when 7 rings cost $ 19.74.

21. 285 fans, when 5 fans cost $ 1.75.

22. 144 knives, when 6 knives cost $ 5.04.

23. 78 vases, when 6 vases cost $ 17.76.

24. 248 hats, when 8 hats cost $ 15.68.

25. 24 pictures, when 4 pictures cost $ 18.92.

26. 48 lamps, when 16 lamps cost $ 34.56.

27. 54 clocks, when 27 clocks cost $ 72.63.

28. 28 desks, when 14 desks cost $ 173.32.

29. 78 rockers, when 26 rockers cost $ 196.30.

30. 36 watches, when 18 watches cost $ 702.

31. 36 cords of wood, when 6 cords cost $ 35.04.

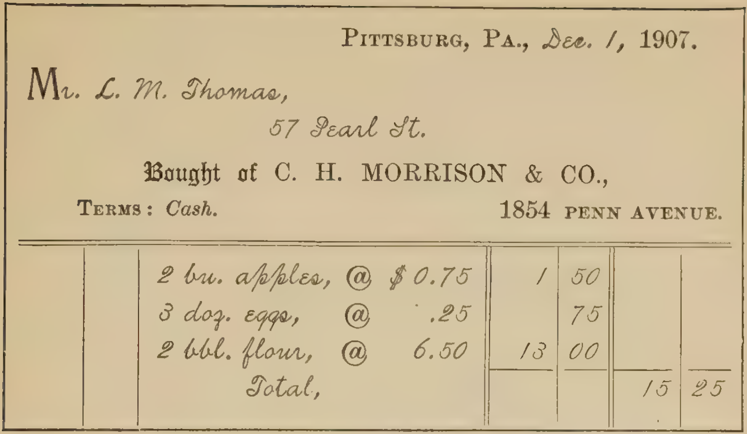
32. 128 tons of coal, when 8 tons cost $ 57.60.

33. 180 quarts of milk, when 18 quarts cost $ 1.08.

34. 56 crates of melons, when 8 crates cost $ 28.80.

35. 328 books, when 8 books cost $ 1.44.

BILLS



PITTSBURG, PA., *Dec. 1,* 1907.

Mr. *L. M. Thomas,*

57 Pearl St.

Bought of C. H. MORRISON & CO.,

TERMS: *Cash.* 1854 PENN AVENUE.

		2 bu. apples, @ $0.75	*1*	*50*		
		3 doz. eggs, @ .25		*75*		
		2 bbl. flour, @ 6.50	*13*	*00*		
		Total,			*15*	*25*

Observe that this bill shows: (1) the *place* and the *date*; (2) who *bought* the goods; (3) who *sold* the goods; (4) the *name of the goods* sold and the *price* and the *amount* of each sale.

The abbreviation @ for "at" should always be used in making out a bill.

To **foot** a bill means to add the cost of all the separate articles.

The word **total** means the amount of the sales.

Make bills of the following sales, using a schoolmate's name as purchaser, and your grocer as the one who sells the goods.

1. 2 lb. butter, @ 25¢
   6 lb. meat, @ 15¢
   3 bars soap, @ 10¢

Make out bills as suggested on previous page.

2.	3 skeins yarn, @	$0.08
	4 papers needles, @	.05
	5 yd. ribbon, @	.50
3.	5 bu. potatoes, @	$0.75
	3 boxes peaches, @	1.50
	12 doz. lemons, @	.40
4.	4 spools thread, @	$0.05
	6 papers pins, @	.10
	5 cards hooks and eyes, @	.02
5.	5 lb. roast beef, @	$0.15
	3 lb. pork chops, @	.15
	4 lb. lamb chops, @	.18
6.	7 silver forks, @	$2.00
	3 sterling spoons, @	1.75
	4 napkin rings, @	3.25
7.	4 nickel sponge racks, @	$2.25
	5 hairbrushes, @	2.00
	6 nickel towel rods, @	.75
8.	4 doz. linen writing paper, @	$0.20
	4 doz. linen envelopes, @	.15
	12 stamps, @	.02
9.	12 pkgs. flax seed, @	$0.05
	3 oz. cologne, @	.10
	5 lb. paint, @	.20
10.	2 music cabinets, @	$15.00
	5 rocking chairs, @	5.00
	3 medicine cabinets, @	3.00

REVIEW OF MEASURES

1. Give the table used for measuring liquids.

2. Name some articles sold by liquid measure.

3. Give the table used for measuring dry and bulky articles.

4. Name the most common articles sold by the peck or the bushel.

5. Give the table of measures of weight.

6. Name the most common articles sold by the ounce; the pound; the ton.

7. Give the table used for measuring time.

8. Give the table of measures of length. What measures are used for measuring short distances? long distances?

9. Give the table of measures of surface.

10. Write the names of the measures on blackboard or paper, and write each of the following under its proper measure: oil, cheese, oats, hay, beans, potatoes, coal, cloth, molasses, sugar, rice, the surface of the blackboard, the width of the room, the length of the blackboard.

11. Draw a diagram to show the number of square inches in an oblong 4 in. by 3 in.

12. Show by diagram that 9 square feet equal one square yard.

13. Show by a diagram on a scale of $\frac{1}{12}$ inch to the foot that 144 square inches equal one square foot.

MEASURES

Change:

1. 16 pt. to gallons.
2. 24 bu. to pecks.
3. 3 sq. ft. to sq. inches.
4. 17 yd. to feet.
5. 120 ft. to inches.
6. 50 lb. to ounces.
7. 6 T. to pounds.
8. 74 pk. to bushels.
9. 3750 yd. to feet.
10. 3 in. to feet.
11. 6 mi. to rods.
12. 360 ft. to yards.
13. 4860 in. to feet.
14. 6966 sq. ft. to sq. yd.

15. How many dozen oranges, and how many over are there in a box containing 143 oranges? 165 oranges? 195 oranges?

16. Find the number of square inches in a flower bed 4 feet long and 3 feet wide.

17. The slate blackboard is 3 feet wide and 26 feet long. Find its surface in square feet.

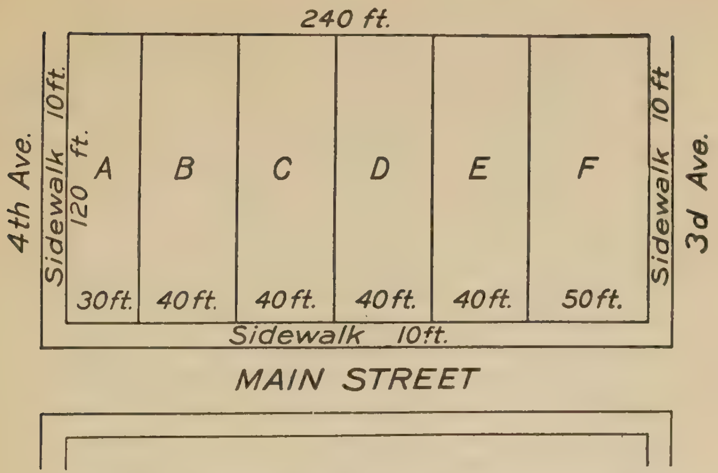
18. A fruit dealer buys chestnuts at $3 per bushel, and sells them at $.10 per quart. Find his profit.

19. The schoolroom floor is 36 feet long and 28 feet wide. Find the number of square feet in the floor; in the ceiling.

20. James walks to school every morning, 600 yards. How many feet does he walk each day, in going to and coming from school?

21. A huckster sells 10 bushel-crates of peaches at 20 cents per quarter peck. Find the amount from the sale of the peaches.

PRACTICAL WORK



1. Mr. Stokes, a real estate agent, purchased this plan of lots at $70 per front foot on Main Street. Find the cost of the plan of lots.

2. Mr. R. M. Holland purchased lot A at $110 per front foot, and built on it a house for $6450. Find the cost of Mr. Holland's property.

3. Mr. Remington purchased lots B and C for $8000. He put an iron fence around his lots at $1.10 per foot. Find the cost of the fence.

4. The concrete sidewalk on Main St. is 10 ft. in width. Find the cost of Mr. Remington's walk at 19¢ per square foot.

5. Mr. Stokes sells lots D, E, and F to L. F. Holtzman for $9500. Find his profits on these lots.

REVIEW

Divide and test:

	a	*b*	*c*
1.	16434 by 64	28792 by 270	33467 by 890
2.	34643 by 28	75639 by 770	77304 by 860
3.	19603 by 83	66041 by 602	44384 by 280
4.	94432 by 62	77006 by 784	35690 by 761
5.	26341 by 74	60424 by 603	88762 by 892
6.	36236 by 37	90328 by 735	56044 by 883
7.	42624 by 41	76028 by 344	76428 by 444
8.	76342 by 36	84605 by 766	23688 by 985
9.	64283 by 24	16248 by 860	55624 by 666
10.	55022 by 82	74637 by 450	34632 by 555
11.	44302 by 74	68026 by 360	99240 by 461
12.	16792 by 81	84132 by 770	36002 by 880
13.	28644 by 73	70066 by 880	45676 by 390
14.	74305 by 37	50468 by 480	76324 by 302
15.	83265 by 87	66399 by 790	25321 by 440
16.	78325 by 75	24166 by 670	65436 by 784
17.	85679 by 41	12345 by 154	70504 by 621
18.	39410 by 52	67890 by 221	62131 by 905
19.	80624 by 63	89765 by 336	88776 by 860
20.	73102 by 74	43210 by 742	54340 by 408
21.	81103 by 85	34786 by 819	82107 by 329
22.	77777 by 96	57602 by 745	62434 by 752
23.	88888 by 72	80703 by 613	93785 by 607

PAID ADMISSIONS TO A FAIR

TICKETS	PRICE	TUES.	WED.	THURS.	FRI.	TOTAL RECEIPTS
Children	15¢	864	1865	1226	1285	
Adults	25¢	2864	3245	2764	3768	
One-horse vehicles	35¢	376	364	176	472	
Two-horse vehicles	50¢	212	216	144	224	

24. Find total admissions of each class, and the receipts in money from each in the 4 days.

25. Find the receipts in money each day.

26. Add daily receipts; add total receipts for each class.

27. A dealer pays $312.50 for 25 children's bicycles. How much is that apiece?

28. A merchant pays $17.28 for 4 dozen boys' caps. Find the cost of each cap.

29. At $84 per dozen, how much does a jeweler pay for 15 watches?

30. A concrete walk 80 ft. long and 4 ft. wide costs $57.60. How much is that a square foot?

31. A ranchman clipped $4\frac{2}{3}$ pounds of wool on an average from each of 2175 sheep. How much is it worth at 40¢ per pound?

32. John's books weigh $2\frac{3}{4}$ lb., and he weighs $58\frac{1}{2}$ lb. How much does he weigh with the books in his hand?

33. There are 1232 pupils in a school, and $\frac{5}{8}$ are girls. Find the number of girls in school; the number of boys.

34. A student buys a dictionary for $15, paying 50¢ down, and the balance in weekly installments of 25¢. How many weeks will it take to cancel the debt?

35. James picked 4 bu. 3 pk. of berries, and sold them at 8¢ a quart. How much did he receive?

36. A lamp in a lighthouse consumes 2 gallons 1 quart of oil daily. Find the cost of the oil for September, October, and November at 18¢ per gallon.

37. Make out the bill for the following: 3 pk. of potatoes at 20¢ a peck, 12 lb. of sugar at 7¢ a pound, 5 qt. of molasses at 15¢ a quart, 2 lb. of cheese at 25¢ a pound. How much change should be received from $5?

38. A dealer buys three paintings at auction for $544. If he sells one for $250, another for $275, and the third for $375, how much does he gain?

39. Find the cost of 2 bushels 2 pecks of nuts at 15 cents a peck.

40. In one season a pear orchard of 384 trees averaged $1\frac{3}{4}$ bu. of pears to the tree. Find their value at $1.25 a bushel.

41. How much do I gain on a box of fine soap costing $1.80 and containing a dozen cakes, if I sell the soap at 20¢ a cake?

42. A building lot 144 feet long is $\frac{1}{4}$ as wide. How wide is it? How many square feet does it contain?

43. Find the cost of 3 bu. of cherries at 6¢ a quart.

44. There are 30 passengers seated and 13 standing in a car, in which the conductor has collected $4.15 in 5¢ fares. How many people have left the car?

45. An oblong field is 80 rods long and 25 rods wide. How many rods of fence will it take to inclose it?

46. How many square yards are there in the floor of a room 18 feet long and 15 feet wide?

47. In Ex. 46 find the perimeter of the room in yards; in feet; in inches.

48. A newsboy buys *Leaders* at the rate of 5 for 3¢, and *News* at the rate of 7 for 10¢. How much does he gain on the sale of 65 *Leaders* at 1¢ each, and 35 *News* at 2¢ each?

49. Find the perimeter in feet, and the area in square inches, of an oblong 26 inches long and 18 inches wide.

50. By selling a horse for $260, I lost $35. How much should I have gained by selling it for $310?

51. A lady bought 4 pairs of kid gloves at $1.50 a pair, 18½ yd. of cambric at 15¢ a yard, 8 yd. of muslin at 12½¢ a yard, and ½ dozen linen napkins at $4 a dozen. Find the cost of all.

52. The population of the United States increased from 9,633,822 in 1820 to 84,907,156 in 1906. Find the increase in this time.

53. A boy earns $1.25 each working day, and his expenses are $4.25 a week. Find his profits in 4 weeks.

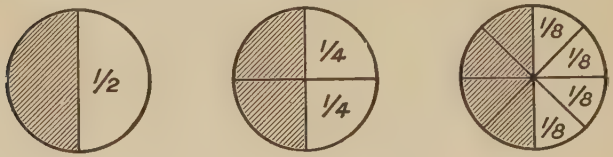
PART IV — FIFTH YEAR

FRACTIONS

Review Pages 107, 108, 147, 54, 55, 148 to 152, 119, 120, 156 to 160, 132 to 137, 163 to 170, and 172 to 182.

Fractional equivalents of halves, fourths, and eighths.

1 unit $= \frac{2}{2}$. 1 unit $= \frac{4}{4}$. 1 unit $= \frac{8}{8}$.



$\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$

1. The first circle is divided into how many equal parts? What is each part called?

2. The second circle is divided into how many equal parts? What is each part called?

3. The third circle is divided into how many equal parts? What is each part called?

4. $\frac{1}{2}$ of the first circle $= \frac{?}{4}$ of the second circle. $\frac{1}{2}$ of the first circle $= \frac{?}{8}$ of the third circle.

5. How many halves of a circle are there in one circle? how many fourths of a circle? how many eighths of a circle?

6. Change $\frac{1}{2}$ to fourths; thus, $\frac{1}{2} = \frac{2}{4}$.

7. Change $\frac{1}{2}$ to eighths; $\frac{2}{2}$ to eighths.

8. How many units are there in $\frac{2}{2}$, $\frac{4}{4}$, $\frac{8}{8}$?

9. $\frac{1}{2}$ of the first circle $+ \frac{1}{2}$ of the first circle $=$ how many times the first circle? Then $\frac{1}{2} + \frac{1}{2} =$ how many?

10. $\frac{1}{4}$ of the second circle + $\frac{1}{4}$ of the second circle = what part of the second circle? Then $\frac{1}{4}+\frac{1}{4}=$ how many?

11. $\frac{2}{4}$ of the second circle + $\frac{2}{4}$ of the second circle = how many times the second circle? Then $\frac{2}{4}+\frac{2}{4}=$ how many?

12. $\frac{4}{8}$ of the third circle $=\frac{?}{2}$ of the same circle. Then $\frac{4}{8}=\frac{?}{2}=\frac{?}{4}$.

13. $\frac{1}{4}=\frac{?}{8}$; $\frac{1}{2}=\frac{?}{8}=\frac{?}{4}$.

14. Change $\frac{1}{2}$ and $\frac{1}{4}$ each to eighths.

15. $\frac{1}{2}$ of an orange $=\frac{?}{4}=\frac{?}{8}$ of the same orange.

16. Four boys each have $\$\frac{1}{4}$. How many dollars have they?

17. $\$\frac{1}{4}+\$\frac{1}{4}=\$\frac{?}{4}$; $\$\frac{1}{2}+\$\frac{1}{4}=\$\frac{?}{4}$; $\frac{1}{8}$ day + $\frac{1}{2}$ day = $\frac{?}{8}$ day.

18. $\$\frac{4}{4}+\$\frac{4}{4}=\$\frac{?}{4}$; $\$\frac{8}{4}=$ how many dollars?

19. $\frac{8}{4}$ days = —days; $\frac{6}{4}$ days = 1 day and $\frac{?}{4}$ days.

20. $\$\frac{1}{4}+\$\frac{1}{2}=\$\frac{?}{4}$; $\$\frac{1}{2}+\$\frac{1}{2}+\$\frac{1}{2}+\$\frac{1}{2}=\$\frac{?}{2}$.

21. Write in order of their size $\frac{1}{2}$ of the first circle; $\frac{3}{4}$ of the second circle, and $\frac{3}{8}$ of the third circle.

A **unit** is any one thing.

A **fraction** is one or more of the equal parts of a unit.

22. Write in figures one half; one fourth. How many figures are needed to express a common fraction? In the fraction $\frac{3}{4}$ what does the 4 show? the 3?

23. Read $\frac{1}{2}$; $\frac{1}{3}$; $\frac{2}{3}$; $\frac{3}{4}$; $\frac{4}{5}$; $\frac{5}{6}$; $\frac{7}{12}$.

24. Write seven eighths; thirteen twenty-fourths.

The **denominator** of a fraction, which is written below the line, shows into how many equal parts the unit is divided.

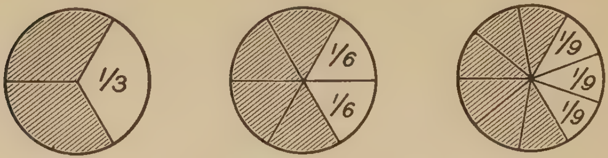
The **numerator** of a fraction, which is written above the line, shows how many equal parts of the fraction are taken.

The **terms** of a fraction are the numerator and denominator.

Fractions are said to be **equivalent** when they have the same value. Thus, $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{4}{8}$ are equivalent fractions.

Fractional equivalents of thirds, sixths, and ninths.

1 unit = $\frac{3}{3}$. 1 unit = $\frac{6}{6}$. 1 unit = $\frac{9}{9}$.



$\frac{1}{3} = \frac{2}{6} = \frac{3}{9}$

1. Into how many parts is the first circle divided? the second circle? the third circle?

2. $\frac{1}{3}$ of a circle $= \frac{?}{6}$ of the circle $= \frac{?}{9}$ of the circle.

3. $\frac{2}{3}$ of a circle $= \frac{?}{6}$ of the circle $= \frac{?}{9}$ of the circle.

4. $\frac{3}{3}$ of a circle $= \frac{?}{6}$ of the circle $= \frac{?}{9}$ of the circle.

5. $\frac{1}{3} + \frac{2}{6} = \frac{?}{6}$; $\frac{1}{3} + \frac{3}{9} = \frac{?}{9}$; $\frac{1}{3} + \frac{3}{6} = \frac{?}{6}$.

6. $\frac{1}{3}$ of an hour $+ \frac{1}{6}$ of an hour $= \frac{?}{6}$ of an hour.

7. $\frac{2}{3}$ of a day $+ \frac{3}{9}$ of a day $= \frac{?}{9}$ of a day.

8. $\frac{1}{3} + \frac{1}{6} =$ —; $\frac{1}{3} + \frac{1}{9} =$ —; $\frac{1}{2} + \frac{1}{6} =$ —; $\frac{1}{4} + \frac{1}{8} =$ —.

9. Add $\frac{1}{3} + \frac{1}{3} + \frac{1}{3}$; $\frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$; $\frac{1}{2} + \frac{1}{2}$.

10. Draw an oblong and show that $\frac{1}{3}$ of the oblong $= \frac{2}{6}$ of the oblong $= \frac{3}{9}$ of the oblong.

11. Change to equivalent fractions in eighths: $\frac{1}{2}$, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$.

12. $\frac{1}{3} = \frac{?}{6}$; $\frac{2}{3} = \frac{?}{6}$; $\frac{2}{3} = \frac{?}{9}$; $\frac{3}{4} = \frac{?}{8}$.

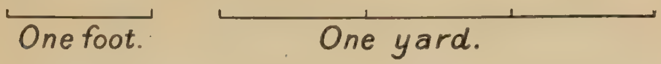
13. How many fourths of a pie $= \frac{6}{8}$ of a pie?

14. Draw squares and show that $\frac{1}{2} = \frac{4}{8}$; that $\frac{3}{4} = \frac{6}{8}$; that $\frac{1}{3} = \frac{3}{9}$; that $\frac{2}{3} = \frac{6}{9}$.

15. How many halves equal one unit? how many thirds? how many fourths? how many sixths? how many ninths?

16. $\frac{4}{2} =$ how many units? $\frac{12}{6} =$ how many units? $\frac{8}{4} =$ how many units? $\frac{9}{3} =$ how many units?

Fractional equivalents of the yard and the foot, and their sum.



1. A foot is what part of a yard?

2. 2 feet are what part of a yard?

3. Into how many parts is the yard divided?

4. How many feet equal $\frac{1}{3}$ of a yard? $\frac{2}{3}$ of a yard? $\frac{3}{3}$ of a yard?

5. Measure a yard on the blackboard. Divide the yard into feet. Divide a foot into inches.

6. How many inches equal $\frac{1}{2}$ of a foot? $\frac{2}{3}$ of a foot? $\frac{3}{4}$ of a foot? $1\frac{1}{2}$ feet? $2\frac{1}{2}$ feet?

7. 6 inches are what part of a foot? of 2 feet? of a yard?

8. 4 inches are what part of a foot? of 2 feet?

9. $1\frac{1}{2}$ ft. + $1\frac{1}{2}$ ft. = — ft.

10. $\frac{1}{2} = \frac{?}{4}$; $\frac{1}{2} + \frac{1}{4} = \frac{?}{4}$; $\frac{1}{2} = \frac{?}{6}$; $\frac{1}{2} + \frac{3}{6} = \frac{?}{6}$.

11. $1\frac{1}{4}$ ft. + $\frac{1}{2}$ ft. = how many ft.? $1\frac{1}{4} + \frac{1}{2} =$ —.

12. $\frac{1}{3}$ yd. + $\frac{1}{2}$ yd. + $\frac{1}{6}$ yd. = — yd. = — ft.

13. $2\frac{1}{3}$ ft. + $3\frac{2}{3}$ ft. = — ft. = — yd.

14. $\frac{3}{4}$ ft. + $\frac{1}{4}$ ft. = — ft.; $\frac{3}{4}$ ft. + $\frac{3}{4}$ ft. + $\frac{2}{4}$ ft. = — ft.

15. $\frac{4}{2}$ ft. = — ft.; $\frac{6}{3}$ ft. = — ft.; $\frac{6}{4}$ ft. = — ft.

Add:

16. $2\frac{3}{4}$ in.
$3\frac{1}{2}$ in.

17. $5\frac{1}{2}$ yd.
$8\frac{1}{6}$ yd.

18. $\frac{1}{2}$ ft.
$2\frac{1}{4}$ ft.

19. $2\frac{1}{3}$ ft.
$8\frac{5}{6}$ ft.

20. $3\frac{1}{4}$ ft.
$2\frac{3}{4}$ ft.
$3\frac{1}{2}$ ft.

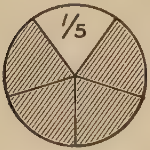
21. $7\frac{1}{3}$ yd.
$6\frac{1}{6}$ yd.
$5\frac{1}{2}$ yd.

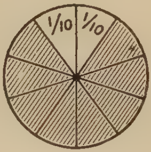
22. $\frac{1}{3}$ ft.
$2\frac{5}{6}$ ft.
$\frac{5}{6}$ ft.

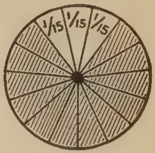
23. $10\frac{1}{2}$ ft.
$15\frac{3}{4}$ ft.
$20\frac{1}{2}$ ft.

Fractional equivalents of fifths, tenths, and fifteenths, and their sum and difference.

1 unit $= \frac{5}{5}$. 1 unit $= \frac{10}{10}$. 1 unit $= \frac{15}{15}$.







$\frac{1}{5} = \frac{2}{10} = \frac{3}{15}$

1. Into how many parts is the first circle divided? the second circle? the third circle?

2. Observe the parts of each circle that are not shaded. $\frac{1}{5} = \frac{?}{10} = \frac{?}{15}$.

3. Then $\frac{2}{5} = \frac{?}{10} = \frac{?}{15}$; $\frac{3}{5} = \frac{?}{10} = \frac{?}{15}$; $\frac{4}{5} = \frac{?}{10} = \frac{?}{15}$.

4. Each of five boys had $\frac{1}{5}$ of a dollar. How many dollars did they have?

5. What is meant by $\frac{1}{5}$ of a circle? $\frac{2}{5}$ of a circle? $\frac{3}{5}$ of a circle? $\frac{1}{10}$ of a circle? $\frac{1}{15}$ of a circle?

6. $\frac{2}{5}$ of a circle $+ \frac{2}{5}$ of the same circle $= \frac{?}{5}$ of the circle. Then $\frac{2}{5} + \frac{2}{5} = \frac{?}{5}$; $\frac{4}{5} - \frac{2}{5} = \frac{?}{5}$; $\frac{4}{5} - \frac{3}{5} = \frac{?}{5}$.

7. How many parts of a unit are there in $\frac{1}{5} + \frac{1}{5} + \frac{1}{5}$? in $\frac{2}{5} + \frac{2}{5}$? in $\frac{2}{10} + \frac{5}{10} + \frac{3}{10}$? in $\frac{3}{15} + \frac{8}{15} + \frac{3}{15}$? in $\frac{8}{15} - \frac{3}{15}$?

8. $\frac{1}{5} + \frac{1}{10} = \frac{?}{80}$; $\frac{1}{5} + \frac{1}{15} = \frac{?}{15}$; $\frac{1}{3} + \frac{1}{5} = \frac{?}{15}$.

9. $\frac{5}{5} + \frac{5}{5} = \frac{?}{5}$? Then $\frac{10}{5} =$ how many units?

10. $\frac{8}{5} =$ how many units and $\frac{3}{5}$ remaining?

11. $\frac{12}{5} =$ how many units and $\frac{2}{5}$ remaining?

12. $\frac{15}{10} =$ how many units and $\frac{5}{10}$ remaining?

13. Change to units and parts of units: $\frac{6}{5}$, $\frac{8}{5}$, $\frac{12}{5}$, $\frac{12}{10}$.

Add:

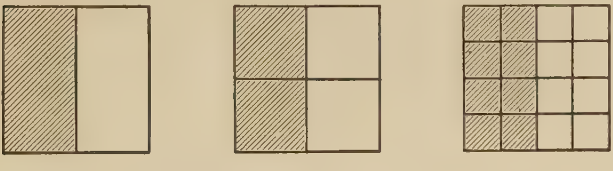
14. $\$2\frac{1}{5}$ $3\frac{1}{10}$	**15.** $25\frac{3}{5}$ mi. $4\frac{1}{5}$ mi.	**16.** $\$11\frac{1}{5}$ $5\frac{3}{10}$	**17.** $5\frac{3}{15}$ $4\frac{1}{5}$
18. $24\frac{1}{5}$ mi. $4\frac{12}{15}$ mi. $5\frac{1}{5}$ mi.	**19.** $\$23\frac{1}{5}$ $7\frac{3}{10}$ $31\frac{4}{5}$	**20.** $50\frac{1}{5}$ $35\frac{3}{15}$ $4\frac{4}{5}$	**21.** $24\frac{1}{4}$ da. $3\frac{7}{8}$ da. $4\frac{1}{2}$ da.

Subtract:

22. $\$3\frac{1}{5}$ $2\frac{1}{10}$	**23.** $25\frac{1}{5}$ hr. $13\frac{1}{15}$ hr.	**24.** $\$14\frac{2}{5}$ $10\frac{1}{10}$	**25.** $78\frac{3}{5}$ min. $42\frac{1}{15}$ min.

Fractional equivalents of halves, fourths, and sixteenths, and their sum and difference.

1 unit = $\frac{2}{2}$. 1 unit = $\frac{4}{4}$. 1 unit = $\frac{16}{16}$.



$$\frac{1}{2} = \frac{2}{4} = \frac{8}{16}$$

1. How do these three units compare in size?

2. Into how many parts is the first square divided? the second square? the third square?

3. $\frac{1}{2}$ of the first square = — fourths of the second square = — sixteenths of the third square.

4. $\frac{2}{2}$ = —units; $\frac{4}{4}$ = —units; $\frac{8}{8}$ = —units; $\frac{16}{16}$ = -- units.

5. $\frac{1}{2} = \frac{?}{4} = \frac{?}{8} = \frac{?}{16}$.

6. $\frac{1}{4} = \frac{?}{8} = \frac{?}{16}$; $\frac{1}{8} = \frac{?}{16}$.

7. $\frac{2}{4}=\frac{?}{8}=\frac{?}{16}$; $\frac{3}{4}=\frac{?}{8}=\frac{?}{16}$.

8. $\frac{2}{8}=\frac{?}{16}=\frac{?}{4}$; $\frac{4}{8}=\frac{?}{16}=\frac{?}{2}$; $\frac{6}{8}=\frac{?}{16}=\frac{?}{4}$.

9. $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}=\frac{?}{8}$; $\frac{1}{4}+\frac{3}{8}+\frac{3}{16}=\frac{?}{16}$; $\frac{9}{16}-\frac{1}{4}=\frac{?}{16}$.

Add:

10. $\begin{array}{r}3\frac{1}{3}\text{ ft.}\\5\frac{1}{6}\text{ ft.}\\2\frac{1}{2}\text{ ft.}\\3\frac{1}{2}\text{ ft.}\\\hline\end{array}$ **11.** $\begin{array}{r}16\frac{1}{2}\text{ ft.}\\20\frac{1}{4}\text{ ft.}\\17\frac{1}{8}\text{ ft.}\\10\frac{3}{16}\text{ ft.}\\\hline\end{array}$ **12.** $\begin{array}{r}12\frac{1}{4}\\14\frac{1}{2}\\10\frac{5}{8}\\12\frac{1}{2}\\\hline\end{array}$ **13.** $\begin{array}{r}10\frac{3}{8}\\5\frac{1}{2}\\6\frac{3}{4}\\8\frac{3}{16}\\\hline\end{array}$

Subtract:

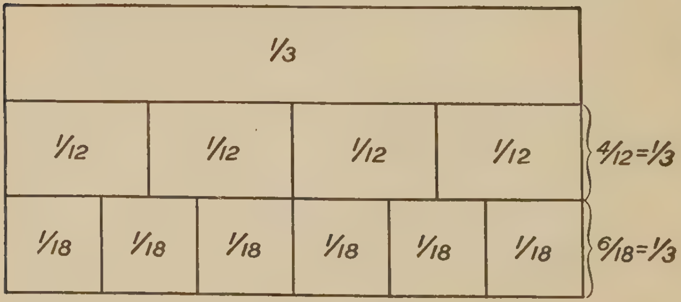
14. $\begin{array}{r}\$12\frac{1}{2}\\8\frac{1}{4}\\\hline\end{array}$ **15.** $\begin{array}{r}23\frac{3}{4}\text{ yd.}\\18\frac{1}{16}\text{ yd.}\\\hline\end{array}$ **16.** $\begin{array}{r}13\frac{1}{2}\text{ mi.}\\9\frac{3}{16}\text{ mi.}\\\hline\end{array}$ **17.** $\begin{array}{r}68\frac{3}{4}\\52\frac{3}{16}\\\hline\end{array}$

18. A flower bed is 4 ft. 6 in. long and 3 ft. 4 in. wide. Find the distance around it.

19. The school ground is in the form of a square, $13\frac{1}{2}$ rd. on a side. Find the distance in rods around it.

Fractional equivalents of sixths, twelfths, and eighteenths, and their sum and difference.

1 unit $=\frac{3}{3}=\frac{12}{12}=\frac{18}{18}$.



1. Into how many thirds can the oblong be divided? into how many twelfths? into how many eighteenths?

2. $\frac{1}{3}=\frac{?}{12}=\frac{?}{18}$; $\frac{2}{3}=\frac{?}{12}=\frac{?}{18}$.

3. $\frac{2}{3}$ of a day = how many 9ths of a day? how many 18ths of a day?

4. $\frac{1}{2}$ hour = $\frac{?}{12}$ of an hour; = $\frac{?}{18}$ of an hour.

5. Change to 18ths: $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{9}$.

6. Change to 16ths: $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{8}$.

7. $\frac{6}{3}$ = how many units? $\frac{12}{3}$ = how many units?

8. Change to 3ds: $\frac{6}{18}$, $\frac{6}{9}$, $\frac{12}{18}$, $\frac{3}{9}$.

9. Draw oblongs and show that $\frac{1}{3}=\frac{2}{6}$; $\frac{4}{8}=\frac{1}{2}$; $\frac{9}{18}=\frac{1}{2}$; $\frac{12}{18}=\frac{2}{3}$; $\frac{9}{12}=\frac{3}{4}$.

10. $\frac{18}{18}$ = how many units? $\frac{20}{18}$ = how many units and $\frac{2}{18}$ remaining?

11. Change to units and parts of units: $\frac{3}{2}$, $\frac{9}{6}$, $\frac{10}{8}$, $\frac{12}{6}$, $\frac{15}{10}$, $\frac{8}{5}$, $\frac{16}{10}$, $\frac{16}{15}$, $\frac{20}{16}$.

Add:

12. $\begin{array}{r} 29\frac{1}{4} \\ 32\frac{1}{6} \\ \underline{45\frac{5}{12}} \end{array}$ **13.** $\begin{array}{r} 7\frac{1}{16} \\ 10\frac{3}{4} \\ \underline{25\frac{7}{8}} \end{array}$ **14.** $\begin{array}{r} 39\frac{1}{6} \\ 42\frac{5}{12} \\ \underline{23\frac{7}{18}} \end{array}$ **15.** $\begin{array}{r} 5\frac{1}{3} \\ 6\frac{5}{6} \\ \underline{12\frac{7}{18}} \end{array}$

16. $\begin{array}{rl} 27\frac{3}{4} & \text{ft.} \\ 45\frac{7}{8} & \text{ft.} \\ \hline 25\frac{3}{16} & \text{ft.} \end{array}$ **17.** $\begin{array}{rl} 15\frac{1}{5} & \text{mi.} \\ 29\frac{4}{15} & \text{mi.} \\ 31\frac{1}{3} & \text{mi.} \end{array}$ **18.** $\begin{array}{rl} 14\frac{1}{8} & \text{bu.} \\ 19\frac{1}{4} & \text{bu.} \\ 16\frac{5}{8} & \text{bu.} \end{array}$ **19.** $\begin{array}{rl} 12\frac{1}{3} & \text{da.} \\ 10\frac{1}{4} & \text{da.} \\ 13\frac{1}{12} & \text{da.} \end{array}$

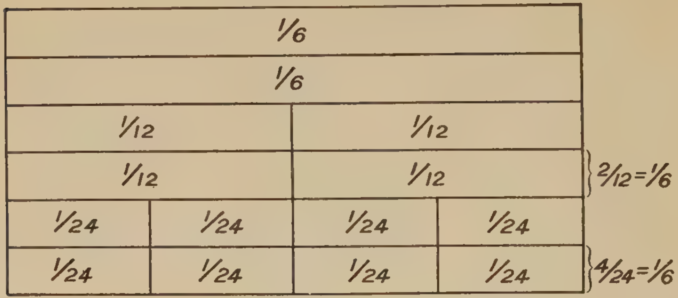
Subtract:

20. $\begin{array}{r} 8\frac{1}{3} \\ \underline{6\frac{1}{12}} \end{array}$ **21.** $\begin{array}{r} 17\frac{1}{3} \\ \underline{15\frac{1}{18}} \end{array}$ **22.** $\begin{array}{r} 14\frac{2}{3} \\ \underline{12\frac{1}{12}} \end{array}$ **23.** $\begin{array}{r} 32\frac{5}{12} \\ \underline{30\frac{1}{3}} \end{array}$

24. $\begin{array}{rl} 7\frac{2}{3} & \text{in.} \\ 5\frac{1}{12} & \text{in.} \end{array}$ **25.** $\begin{array}{rl} 9\frac{2}{3} & \text{bu.} \\ 7\frac{1}{18} & \text{bu.} \end{array}$ **26.** $\begin{array}{rl} 10\frac{1}{3} & \text{lb.} \\ 6\frac{1}{12} & \text{lb.} \end{array}$ **27.** $\begin{array}{rl} 15\frac{11}{12} & \text{da.} \\ 5\frac{2}{3} & \text{da.} \end{array}$

Fractional equivalents of sixths, twelfths, and twenty-fourths, and their sum and difference.

$$1 \text{ unit} = \frac{6}{6} = \frac{12}{12} = \frac{24}{24}.$$



1. What part of the oblong $= \frac{3}{6}$ of it? $\frac{6}{12}$ of it? $\frac{12}{24}$ of it?

2. $\frac{5}{6}$ of the oblong $= \frac{?}{12}$ of the oblong; equals $\frac{?}{24}$ of it.

3. $\frac{4}{24}$ of the oblong $= \frac{?}{6}$ of the oblong; equals $\frac{?}{12}$ of it.

4. $\frac{3}{6} + \frac{3}{6} + \frac{3}{6} + \frac{3}{6} = \frac{?}{6}$; equals how many units?

5. Any unit can be divided into how many halves? 3ds? 4ths? 5ths? 6ths? 7ths? 8ths? 16ths? 24ths, etc.?

6. Add $\frac{1}{6}$ and $\frac{1}{12}$; $\frac{1}{12}$ and $\frac{1}{24}$. From $\frac{5}{24}$ take $\frac{1}{12}$.

7. From $\frac{23}{24}$ subtract $\frac{1}{6}$; $\frac{5}{12}$; $\frac{5}{6}$; $\frac{7}{12}$.

8. $\frac{8}{5}$ means that a unit $(\frac{5}{5})$ and a part of a unit $(\frac{3}{5})$ have been added. What does $\frac{8}{7}$ mean? $\frac{9}{8}$?

Add:

9.	**10.**	**11.**	**12.**
$18\frac{1}{6}$ in.	$15\frac{5}{6}$ bu.	$19\frac{1}{6}$	$40\frac{7}{24}$
$20\frac{1}{12}$ in.	$27\frac{1}{24}$ bu.	$32\frac{5}{12}$	$30\frac{1}{12}$
$39\frac{1}{24}$ in.	$41\frac{10}{12}$ bu.	$20\frac{5}{24}$	$18\frac{1}{6}$

Subtract:

13.	**14.**	**15.**	**16.**
$9\frac{1}{6}$ yd.	$14\frac{5}{6}$ da.	$28\frac{7}{12}$	$39\frac{5}{6}$
$7\frac{1}{12}$ yd.	$7\frac{5}{12}$ da.	$13\frac{5}{24}$	$8\frac{7}{24}$

REDUCTION OF FRACTIONS

1. Notice in the diagram on p. 194 that $\frac{1}{6}=\frac{4}{24}$. By what number are both numerator and denominator of $\frac{1}{6}$ *multiplied* to change it to $\frac{4}{24}$? Is there any difference in *value* between $\frac{1}{6}$ and $\frac{4}{24}$? Notice that the terms in $\frac{4}{24}$ are larger or *higher* than in $\frac{1}{6}$. The change of $\frac{1}{6}$ to the equal fraction $\frac{4}{24}$ is called **changing or reducing** $\frac{1}{6}$ **to higher terms.**

2. By what number must both terms of $\frac{4}{24}$ be *divided* to change $\frac{4}{24}$ to $\frac{1}{6}$? Is there any difference in *value* between $\frac{4}{24}$ and $\frac{1}{6}$? Which fraction has the **lower terms**? The change of $\frac{4}{24}$ to $\frac{1}{6}$ is called **reducing** $\frac{4}{24}$ **to lower terms.**

3. Notice in the diagram that $\frac{4}{24}=\frac{2}{12}=\frac{1}{6}$. When $\frac{4}{24}$ is changed to $\frac{2}{12}$ it is reduced to *lower* terms but not to its *lowest* terms, since $\frac{2}{12}$ can be changed to still lower terms, $\frac{1}{6}$. Can $\frac{1}{6}$ be reduced to still lower terms? The change of $\frac{4}{24}$ to $\frac{1}{6}$ is called **reducing** $\frac{4}{24}$ **to its lowest terms.**

4. By what number must both terms of $\frac{1}{2}$ be multiplied to change it to the equal fraction $\frac{3}{6}$? By what number must both terms of $\frac{8}{10}$ be divided to change it to the equal fraction $\frac{4}{5}$? Is $\frac{4}{5}$ in its lowest terms?

Multiplying or dividing both terms of a fraction by the same number does not alter its value.

5. Reduce to higher terms: $\frac{1}{2}$; $\frac{2}{3}$; $\frac{3}{4}$; $\frac{4}{5}$; $\frac{5}{6}$; $\frac{7}{8}$; $\frac{2}{9}$; $\frac{1}{10}$

6. Reduce to lowest terms: $\frac{2}{4}$; $\frac{4}{8}$; $\frac{4}{6}$; $\frac{3}{9}$; $\frac{4}{16}$; $\frac{8}{10}$.

Fractions like $\frac{1}{5}$, $\frac{2}{5}$, and $\frac{4}{5}$, which have the same denominator, are said to have a **common denominator.**

Similar fractions are fractions that have a common denominator.

7. Change to similar fractions $\frac{1}{2}$ and $\frac{3}{4}$; $\frac{1}{3}$ and $\frac{1}{6}$; $\frac{1}{6}$ and $\frac{1}{12}$; $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{3}{8}$.

Written Work

1. Change $\frac{2}{3}$ and $\frac{3}{4}$ to similar fractions having the *common denominator* 12.

$$\frac{2\times4}{3\times4}=\frac{8}{12}$$

$$\frac{3\times3}{4\times3}=\frac{9}{12}$$

Since the denominator 3 in $\frac{2}{3}$ must be multiplied by 4 to produce 12, the numerator must also be multiplied by 4, so as not to change the value of the fraction. $\frac{2\times4}{3\times4}=\frac{8}{12}$. Since the denominator 4 in $\frac{3}{4}$ must be multiplied by 3 to produce 12, the numerator 3 must also be multiplied by 3. $\frac{3\times3}{4\times3}=\frac{9}{12}$. Hence the similar fractions are $\frac{8}{12}$ and $\frac{9}{12}$.

Change to similar fractions:

2. $\frac{1}{2}$ and $\frac{2}{5}$
3. $\frac{3}{4}$ and $\frac{5}{6}$
4. $\frac{2}{3}$ and $\frac{5}{8}$
5. $\frac{4}{9}$ and $\frac{1}{4}$
6. $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{3}{8}$
7. $\frac{2}{3}$, $\frac{1}{2}$, and $\frac{5}{6}$
8. $\frac{1}{3}$, $\frac{2}{9}$, and $\frac{4}{18}$
9. $\frac{5}{6}$, $\frac{3}{8}$, and $\frac{1}{24}$

10. Reduce $\frac{6}{24}$ to its lowest terms.

$$\frac{6\div3}{24\div3}=\frac{2}{8};\ \frac{2\div2}{8\div2}=\frac{1}{4}$$

We can divide both terms, 6 and 24, of the fraction $\frac{6}{24}$ by 3 without changing the *value* of the fraction. The result is $\frac{2}{8}$. We can then divide both terms 2 and 8 of the fraction ^{2} by 2. The result is $\frac{1}{4}$.

Reduce to lowest terms:

11. $\frac{8}{24}$
12. $\frac{9}{27}$
13. $\frac{10}{25}$
14. $\frac{8}{32}$
15. $\frac{18}{36}$
16. $\frac{14}{21}$
17. $\frac{16}{40}$
18. $\frac{14}{35}$
19. $\frac{12}{36}$
20. $\frac{15}{35}$

21. Change $\frac{4}{2}$ to units. Thus, 1 unit = 2 halves. In 4 halves there are 4 ÷ 2, or 2, units. Change $\frac{10}{5}$ to units.

22. Change $\frac{10}{3}$ to units and parts of units. Thus, 1 = 3 thirds. In 10 thirds there are 10 ÷ 3, or 3, units and $\frac{1}{3}$ remaining; that is, $3\frac{1}{3}$.

To change a fraction to units and parts of units, divide the numerator by the denominator.

Change to units and parts of units:

23. $\frac{12}{6}$
24. $\frac{12}{8}$
25. $\frac{10}{6}$
26. $\frac{72}{8}$
27. $\frac{17}{4}$

ADDITION OF FRACTIONS

1. Can you add $\frac{1}{3}$ and $\frac{1}{6}$ without change? Can you add $\frac{2}{6}$ and $\frac{1}{6}$? What change must be made in $\frac{2}{3}$ and $\frac{1}{4}$ before they can be added?

2. $\frac{1}{5} = \frac{?}{10}$; $\frac{2}{5} = \frac{?}{10}$; $\frac{3}{5} = \frac{?}{10}$; $\frac{5}{5} = \frac{?}{10}$?

3. $\frac{1}{2} = \frac{?}{10}$; $\frac{1}{2} + \frac{1}{5} = \frac{?}{10}$; $\frac{1}{2} + \frac{1}{3} = \frac{?}{6}$; $\frac{1}{2} + \frac{1}{8} = \frac{?}{8}$?

4. Can you add $\frac{1}{2}$ and $\frac{1}{5}$ without change? Change both to tenths. Can they then be added?

5. Can you add $\frac{1}{2}$ and $\frac{1}{3}$ without change? Change both to sixths. Can they then be added?

6. When $\frac{1}{2}$ and $\frac{1}{4}$ are to be added, to what similar fractions should they be changed?

7. What are the denominators of the fractions in example 4? To what like or *common denominators* (c. d.) did you change both fractions?

8. What are the denominators of the fractions in example 5? To what denominator did you change the fraction $\frac{1}{2}$? $\frac{1}{3}$? Why?

9. After two or more fractions are changed to like, or *common denominators*, that is, after they have been made *similar*, what is the *second step in adding them?*

10. Add $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$; $\frac{1}{4}$, $\frac{1}{8}$; $\frac{1}{5}$, $\frac{1}{10}$; $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{12}$; $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{15}$.

11. Observe that in problem 10, $\frac{1}{2} + \frac{1}{3} + \frac{1}{6} = \frac{6}{6}$, or 1, and that $\frac{1}{3} + \frac{1}{4} + \frac{1}{12} = \frac{8}{12}$, or $\frac{2}{3}$.

12. What is the *third* step in adding fractions?

Why is the first step not necessary in the following?

13. $\frac{2}{3} + \frac{1}{3}$

14. $\frac{4}{9} + \frac{5}{9}$

15. $\frac{1}{5} + \frac{3}{5}$

16. $\frac{3}{7} + \frac{4}{7}$

17. $\frac{1}{8} + \frac{3}{8} + \frac{5}{8} + \frac{7}{8}$

18. $\frac{1}{10} + \frac{3}{10} + \frac{5}{10} + \frac{9}{10}$

Give the sums at sight:

19. $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}$

20. $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$

21. $\frac{1}{5}+\frac{1}{5}+\frac{1}{5}$

22. $\frac{1}{6}+\frac{1}{6}+\frac{1}{6}$

23. $\frac{1}{8}+\frac{2}{8}+\frac{1}{8}+\frac{3}{8}$

24. $\frac{1}{7}+\frac{2}{7}+\frac{2}{7}+\frac{1}{7}$

25. $\frac{1}{10}+\frac{2}{10}+\frac{2}{10}+\frac{3}{10}$

26. $\frac{1}{12}+\frac{4}{12}+\frac{3}{12}$

27. $\frac{1}{9}+\frac{2}{9}+\frac{3}{9}+\frac{2}{9}$

28. $\frac{1}{14}+\frac{3}{14}+\frac{5}{14}+\frac{2}{14}$

29. $\frac{2}{15}+\frac{3}{15}+\frac{5}{15}+\frac{4}{15}$

30. $\frac{1}{11}+\frac{2}{11}+\frac{5}{11}+\frac{2}{11}$

31. $\frac{1}{16}+\frac{3}{16}+\frac{5}{16}+\frac{2}{16}$

32. $\frac{1}{20}+\frac{4}{20}+\frac{5}{20}+\frac{8}{20}$

33. $\frac{3}{13}+\frac{4}{13}+\frac{1}{13}+\frac{2}{13}$

34. $\frac{5}{25}+\frac{8}{25}+\frac{2}{25}+\frac{4}{25}$

35. $\frac{7}{18}+\frac{2}{18}+\frac{7}{18}+\frac{1}{18}$

36. $\frac{3}{17}+\frac{5}{17}+\frac{4}{17}+\frac{5}{17}$

37. A boy spent $\frac{1}{4}$ of his money for a knife, $\frac{1}{4}$ of it for a ball, and $\frac{1}{4}$ of it for his lunch. What part of his money did he spend?

38. After cutting off $\frac{1}{8}$ of a foot and $\frac{3}{8}$ of a foot from a board, the part remaining was $\frac{3}{8}$ of a foot long. How long was the whole board?

39. I paid \$$\frac{1}{10}$ for milk, \$$\frac{2}{10}$ for lettuce, and \$$\frac{3}{10}$ for butter. What part of a dollar did I pay for all?

40. David paid $\frac{3}{5}$ of a dollar for a fishing rod, and $\frac{1}{5}$ of a dollar for a line. How much did he pay for both?

Adding fractions that are not similar.

Written Work

1. Add $\frac{2}{3}$ and $\frac{1}{4}$.

12 = c. d.

$$\frac{2\times 4}{3\times 4}=\frac{8}{12}$$

$$\frac{1\times 3}{4\times 3}=\frac{3}{12}$$

$$\frac{2}{3}+\frac{1}{4}=\frac{11}{12}$$

The fractions must first be made similar. They may be changed to the common denominator twelfths. Multiplying both terms of $\frac{2}{3}$ by 4 changes it to $\frac{8}{12}$, and multiplying both terms of $\frac{1}{4}$ by 3 changes it to $\frac{3}{12}$. The sum of $\frac{8}{12}$ and $\frac{3}{12}$ is $\frac{11}{12}$.

Fractions must be made similar before they can be added.

Add, using a pencil; then orally:

2. $\frac{1}{2}$ and $\frac{1}{3}$
3. $\frac{1}{2}$ and $\frac{1}{6}$
4. $\frac{1}{3}$ and $\frac{1}{4}$
5. $\frac{1}{2}$ and $\frac{1}{4}$
6. $\frac{1}{3}$ and $\frac{1}{7}$
7. $\frac{1}{2}$ and $\frac{1}{7}$
8. $\frac{1}{4}$ and $\frac{1}{6}$
9. $\frac{1}{2}$ and $\frac{1}{8}$
10. $\frac{1}{4}$ and $\frac{1}{5}$
11. $\frac{1}{3}$ and $\frac{1}{5}$
12. $\frac{1}{7}$ and $\frac{1}{4}$
13. $\frac{1}{2}$ and $\frac{1}{8}$
14. $\frac{1}{3}$ and $\frac{1}{6}$
15. $\frac{1}{5}$ and $\frac{1}{6}$
16. $\frac{1}{3}$ and $\frac{1}{12}$
17. $\frac{1}{2}$ and $\frac{1}{5}$
18. $\frac{1}{3}$ and $\frac{1}{9}$
19. $\frac{1}{6}$ and $\frac{1}{12}$

20. Henry had $\frac{1}{5}$ of a dollar, and found $\frac{1}{4}$ of a dollar. How much had he then?

21. Mary bought $\frac{1}{3}$ of a yard of red ribbon, $\frac{1}{4}$ of a yard of blue ribbon, and $\frac{1}{2}$ of a yard of white ribbon. How many yards of ribbon did she buy?

22. What is the total cost of a ball at $\frac{1}{2}$ of a dollar, a penknife at $\frac{1}{5}$ of a dollar, and a book at $\frac{1}{4}$ of a dollar?

A **mixed number** is a number expressed by a whole number and a fraction; as, $5\frac{1}{4}$, $3\frac{1}{3}$, $17\frac{1}{2}$.

Adding mixed numbers when the sum of the fractions is less than a whole unit.

Written Work

1. Add $2\frac{1}{3}$ and $3\frac{1}{4}$.

$$\begin{array}{rl} & 12 = \text{c. d.} \\ \hline 2\frac{1}{3} & = 2\frac{4}{12} \\ 3\frac{1}{4} & = 3\frac{3}{12} \\ \hline 2\frac{1}{3} + 3\frac{1}{4} & = 5\frac{7}{12} \end{array}$$

$\frac{1}{3}$ and $\frac{1}{4}$ may each be changed to twelfths. Write the common denominator (c. d.), 12, above the fractions. $\frac{1 \times 4}{3 \times 4} = \frac{4}{12}$; $\frac{1 \times 3}{4 \times 3} = \frac{3}{12}$. The sum of the fractions is $\frac{7}{12}$ and the sum of the integers is 5; $5 + \frac{7}{12} = 5\frac{7}{12}$.

Add:

2.	**3.**	**4.**	**5.**
$5\frac{1}{2}$	$12\frac{1}{3}$	$1\frac{1}{2}$	$35\frac{1}{4}$
$6\frac{1}{3}$	$14\frac{1}{4}$	$20\frac{1}{6}$	$60\frac{1}{5}$
1	2	$8\frac{1}{12}$	$42\frac{1}{20}$

Add:

6. $\frac{1}{2}$ $40\frac{1}{5}$ $18\frac{1}{10}$	**7.** $20\frac{1}{3}$ $24\frac{1}{9}$ $28\frac{1}{18}$	**8.** $111\frac{1}{5}$ $\frac{1}{6}$ $37\frac{1}{30}$	**9.** $20\frac{1}{4}$ $145\frac{1}{16}$ $230\frac{1}{8}$
10. $100\frac{1}{3}$ $80\frac{1}{12}$ $205\frac{1}{36}$	**11.** $35\frac{1}{5}$ $6\frac{1}{8}$ $117\frac{1}{40}$	**12.** $12\frac{1}{3}$ $10\frac{1}{6}$ $1\frac{1}{9}$	**13.** $128\frac{1}{2}$ $3\frac{1}{5}$ $9\frac{1}{20}$

14. A man walked $3\frac{1}{3}$ miles one hour, $3\frac{1}{4}$ miles the second hour, and $2\frac{1}{4}$ miles the third hour. How far did he walk?

15. A farmer sold corn for \$ $14\frac{1}{4}$, wheat for \$ $37\frac{1}{5}$, and rye for \$ $15\frac{1}{10}$. How much did he receive for all?

Adding mixed numbers when the sum of the fractions is greater than a whole unit.

Written Work

1. Add $8\frac{2}{3}$ and $12\frac{3}{5}$.

$$15 = \text{c. d.}$$
$$8\frac{2}{3} = 8\frac{10}{15}$$
$$12\frac{3}{5} = 12\frac{9}{15}$$
$$8\frac{2}{3} + 12\frac{3}{5} = 20\frac{19}{15} \text{ or } 21\frac{4}{15}$$

$\frac{2}{3}$ and $\frac{3}{5}$ may each be changed to fifteenths. $\frac{2 \times 5}{3 \times 5} = \frac{10}{15}$; $\frac{3 \times 3}{5 \times 3} = \frac{9}{15}$. The sum of $\frac{10}{15}$ and $\frac{9}{15}$ is $\frac{19}{15}$, which equals $1\frac{4}{15}$. The 1 is added to the sum of 12 and 8, making 21, which with $\frac{4}{15}$, makes $21\frac{4}{15}$.

Add:

2. $7\frac{2}{3}$ $8\frac{1}{2}$	**3.** $150\frac{3}{4}$ $68\frac{5}{8}$	**4.** $80\frac{5}{6}$ $18\frac{2}{3}$	**5.** $32\frac{1}{2}$ $60\frac{5}{12}$
6. $175\frac{1}{5}$ $\frac{3}{10}$ $16\frac{1}{2}$	**7.** $350\frac{7}{12}$ $267\frac{3}{4}$ $419\frac{2}{3}$	**8.** $6\frac{5}{9}$ $14\frac{7}{18}$ $22\frac{1}{3}$	**9.** $17\frac{3}{4}$ $2\frac{1}{5}$ $30\frac{9}{20}$

Add:

10.	**11.**	**12.**	**13.**
$80\frac{1}{4}$	$17\frac{7}{8}$	$20\frac{3}{5}$	$135\frac{1}{5}$
$18\frac{1}{6}$	$71\frac{3}{4}$	$120\frac{3}{4}$	$122\frac{4}{15}$
$42\frac{3}{8}$	$9\frac{9}{16}$	$261\frac{3}{10}$	$118\frac{7}{10}$
$12\frac{5}{24}$	$10\frac{1}{2}$	$268\frac{11}{20}$	$94\frac{11}{30}$

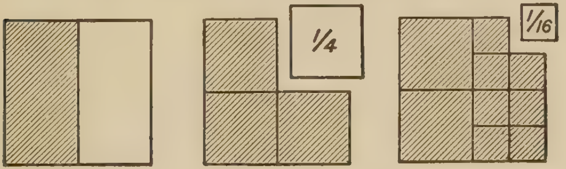
14. Mary bought a reader for $\frac{2}{5}$ of a dollar, a slate for $\frac{3}{10}$ of a dollar, and a grammar for $\frac{1}{2}$ of a dollar. How much did they all cost?

15. A clerk spent $18\frac{1}{2}$ a month for board, $9\frac{4}{5}$ for a room, and $4\frac{7}{10}$ for clothes. How much did he spend in one month?

16. I sold $\frac{1}{4}$ of an acre of land to one man, $2\frac{2}{5}$ acres to another, and $1\frac{3}{4}$ acres to another. How many acres did I sell?

17. Find the perimeter of a sheet of paper $9\frac{1}{4}$ in. by $5\frac{1}{8}$ in.

SUBTRACTION OF FRACTIONS



$\frac{1}{2} = \frac{2}{4} = \frac{8}{16}$

1. 1 sq. in. $-\ \frac{1}{2}$ sq. in = — sq. in.

2. $\frac{1}{2}$ sq. in. $-\ \frac{1}{4}$ sq. in. = — sq. in.

3. 1 sq. in. $-\ \frac{1}{4}$ sq. in = — sq. in.

4. $\frac{1}{2}$ sq. in. $-\ \frac{4}{16}$ sq. in. = — sq. in.

5. $\frac{1}{2}$ sq. in. $-\ \frac{1}{16}$ sq. in. = — sq. in.

6. $\frac{3}{4} - \frac{1}{4} = \frac{?}{4}$; $\frac{5}{8} - \frac{1}{8} = \frac{?}{8}$; $\frac{9}{10} - \frac{3}{10} = \frac{?}{10}$.

7. Give answers to the following: $\frac{11}{12}-\frac{5}{12}$; $\frac{11}{18}-\frac{5}{18}$; $\frac{6}{11}-\frac{4}{11}$; $\frac{19}{20}-\frac{3}{20}$; $\frac{24}{25}-\frac{3}{25}$.

8. What do you notice about the denominators of the fractions you have subtracted in example 7?

In subtraction of fractions, just as in subtraction of whole numbers, the minuend must be *larger* than the subtrahend.

9. When the denominators are alike, what do we subtract?

10. Could you subtract $\frac{1}{3}$ from $\frac{1}{2}$ without change? How may these fractions be made similar?

11. When the denominators are *unlike*, what is the *first step?* What is the *second step?* What is the *third step?*

Subtract:

12. $\$\frac{1}{2}-\$\frac{1}{4}$; $\frac{2}{3}$ ft. $-\frac{1}{4}$ ft.; $\frac{7}{9}$ yd. $-\frac{2}{3}$ yd.; $\frac{11}{12}$ ft. $-\frac{7}{8}$ ft.

13. $\frac{9}{10}-\frac{2}{3}$; $\frac{16}{21}-\frac{3}{7}$; $\frac{11}{12}-\frac{2}{3}$; $\frac{4}{5}-\frac{1}{2}$; $\frac{27}{35}-\frac{2}{5}$; $\frac{7}{8}-\frac{1}{4}$.

Subtracting similar mixed numbers.

Written Work

1. From $3\frac{1}{3}$ take $1\frac{2}{3}$.

$$\begin{array}{r} 3\frac{1}{3}=2\frac{4}{3} \\ 1\frac{2}{3}=1\frac{2}{3} \\ \hline 3\frac{1}{3}-1\frac{2}{3}=1\frac{2}{3} \end{array}$$

Since $\frac{2}{3}$ cannot be subtracted from $\frac{1}{3}$, we take 1 or $\frac{3}{3}$ from 3, and add it to $\frac{1}{3}$, thus changing $3\frac{1}{3}$ to $2\frac{4}{3}$. Then $\frac{2}{3}$ from $\frac{4}{3}$ leaves $\frac{2}{3}$ and 1 from 2 leaves 1. Hence, the answer is $1\frac{2}{3}$.

Find the differences:

2. $2\frac{5}{6}-1\frac{4}{6}$

3. $5\frac{7}{8}-2\frac{5}{8}$

4. $9\frac{11}{12}-6\frac{4}{12}$

5. $20\frac{14}{15}-11\frac{11}{15}$

6. $16\frac{19}{21}-11\frac{7}{21}$

7. $35\frac{9}{10}-5\frac{2}{10}$

8. $17\frac{10}{11}-13\frac{2}{11}$

9. $11\frac{7}{9}-9\frac{3}{9}$

10. $7\frac{4}{5}-2\frac{3}{5}$

11. $13\frac{5}{7}-9\frac{2}{7}$

12. If a boy buys papers at $\frac{3}{5}$ of a cent each, and sells them at 1 cent each, how much does he gain on each paper?

13. I bought a bushel of potatoes for $\frac{8}{10}$ of a dollar, and a bushel of corn for $\frac{5}{10}$ of a dollar. How much more did I pay for the potatoes than for the corn?

14. William bought a hat for \$$2\frac{3}{4}$, and a pair of shoes for \$$2\frac{1}{4}$. How much more did he pay for the hat than for the shoes?

15. From a piece of ribbon $16\frac{7}{12}$ inches long was cut a piece $7\frac{1}{2}$ inches long. What was the length of the piece remaining?

16. One farmer owns $124\frac{15}{16}$ acres of land, and another owns $111\frac{8}{16}$ acres. How many more acres does the one farmer own than the other?

Subtracting fractions or mixed numbers that are not similar.

Written Work

1. From $\frac{1}{4}$ take $\frac{1}{5}$.

$20 = \text{c. d.}$

$\frac{1}{4} - \frac{1}{5}$

$\frac{5}{20} - \frac{4}{20} = \frac{1}{20}$

Before they can be subtracted the fractions must be made similar. Change them both to twentieths. $\frac{1}{4} = \frac{5}{20}$ and $\frac{1}{5} = \frac{4}{20}$. Subtracting, $\frac{5}{20} - \frac{4}{20} = \frac{1}{20}$.

Fractions must be made similar before they can be subtracted.

Subtract, using a pencil; then orally:

2. $\frac{1}{2} - \frac{1}{3}$
3. $\frac{1}{4} - \frac{1}{5}$
4. $\frac{1}{3} - \frac{1}{4}$
5. $\frac{1}{2} - \frac{1}{8}$
6. $\frac{1}{3} - \frac{1}{7}$
7. $\frac{1}{8} - \frac{1}{12}$
8. $\frac{1}{2} - \frac{1}{9}$
9. $\frac{1}{3} - \frac{1}{5}$
10. $\frac{1}{6} - \frac{1}{7}$
11. $\frac{1}{6} - \frac{1}{8}$
12. $\frac{1}{3} - \frac{1}{9}$
13. $\frac{1}{4} - \frac{1}{7}$
14. $\frac{1}{6} - \frac{1}{9}$
15. $\frac{1}{2} - \frac{1}{7}$
16. $\frac{1}{3} - \frac{1}{12}$
17. $\frac{1}{4} - \frac{1}{8}$
18. $\frac{1}{5} - \frac{1}{6}$
19. $\frac{1}{4} - \frac{1}{6}$
20. $\frac{1}{5} - \frac{1}{10}$
21. $\frac{1}{5} - \frac{1}{8}$
22. $\frac{3}{4} - \frac{1}{6}$

23. From a piece of cloth containing $\frac{1}{2}$ of a yard, $\frac{1}{4}$ of a yard was sold. What part of a yard remained?

24. From a city lot containing $\frac{1}{8}$ of an acre, $\frac{1}{16}$ of an acre was sold. What part of an acre remained?

25. A man traveled $\frac{1}{4}$ of a certain distance the first hour, and $\frac{1}{5}$ of the distance the second hour. What part of the distance farther did he travel the first hour than the second?

26. From 7 take $\frac{2}{3}$.

$$\begin{array}{r} 7 = 6\frac{3}{3} \\ \underline{\frac{2}{3} = \quad \frac{2}{3}} \\ 7 - \frac{2}{3} = 6\frac{1}{3} \end{array}$$

Change 7 into $6\frac{3}{3}$. Subtracting $\frac{2}{3}$ from $\frac{3}{3}$ gives $\frac{1}{3}$, which added to 6 gives $6\frac{1}{3}$.

Subtract, using a pencil; then orally:

27. $3 - \frac{1}{2}$
28. $12 - \frac{2}{3}$
29. $18 - \frac{7}{8}$
30. $9 - \frac{5}{6}$
31. $3 - \frac{4}{7}$
32. $100 - \frac{9}{10}$
33. $18 - \frac{14}{15}$
34. $22 - \frac{11}{12}$
35. $7 - \frac{1}{3}$
36. $28 - \frac{11}{14}$
37. $55 - \frac{13}{16}$
38. $4 - \frac{19}{20}$
39. $125 - \frac{1}{18}$
40. $10 - \frac{4}{5}$
41. $133 - \frac{8}{9}$
42. $44 - \frac{2}{25}$
43. $11 - \frac{3}{4}$
44. $40 - \frac{3}{5}$
45. $7 - \frac{8}{11}$
46. $51 - \frac{7}{10}$
47. $48 - \frac{7}{8}$

48. Albert had \$2 and spent $\$\frac{4}{5}$ for skates. How much money had he remaining?

49. A vessel contained 8 gallons of oil. After $\frac{7}{8}$ of a gallon had leaked out, how much remained?

50. A grocer who had bought 10 bushels of potatoes, sold $\frac{3}{4}$ of a bushel. How many bushels remained?

51. From $12\frac{3}{4}$ take $10\frac{1}{2}$.

$$\begin{array}{r} \underline{4 = \text{c. d.}} \\ 12\frac{3}{4} = 12\frac{3}{4} \\ \underline{10\frac{1}{2} = 10\frac{2}{4}} \\ 12\frac{3}{4} - 10\frac{1}{2} = \ 2\frac{1}{4} \end{array}$$

Change $\frac{1}{2}$ to fourths. $\frac{1}{2} = \frac{2}{4}$. $\frac{2}{4}$ from $\frac{3}{4} = \frac{1}{4}$, which added to 12 less 10, or 2, gives $2\frac{1}{4}$.

Find differences:

52. $4\frac{3}{4} - 3\frac{1}{2}$

53. $7\frac{2}{3} - 4\frac{1}{2}$

54. $10\frac{5}{6} - 3\frac{1}{3}$

55. $10\frac{7}{8} - 2\frac{3}{4}$

56. $12\frac{7}{9} - 5\frac{2}{3}$

57. $24\frac{7}{10} - 11\frac{2}{5}$

58. $31\frac{11}{12} - 18\frac{5}{6}$

59. $79\frac{13}{16} - 26\frac{5}{8}$

60. $97\frac{17}{21} - 35\frac{4}{7}$

61. $121\frac{3}{4} - 66\frac{2}{5}$

62. $80\frac{5}{8} - 14\frac{1}{2}$

63. $98\frac{8}{9} - 32\frac{1}{3}$

64. $45\frac{23}{30} - 30\frac{2}{3}$

65. $25\frac{4}{9} - 12\frac{1}{4}$

66. $100\frac{1}{3} - 52\frac{1}{7}$

67. $78\frac{2}{3} - 35\frac{3}{5}$

68. $50\frac{4}{5} - 40\frac{1}{3}$

69. $124\frac{5}{11} - 112\frac{1}{3}$

70. $240\frac{14}{15} - 200\frac{2}{5}$

71. $15\frac{7}{8} - 8\frac{1}{2}$

72. From a lot containing $17\frac{3}{4}$ acres, $5\frac{3}{8}$ acres were sold. How many acres remained?

73. One motorman's trip takes $4\frac{2}{3}$ hours, and another's $2\frac{2}{5}$ hours. How much longer is the first motorman's trip than the second motorman's trip?

74. A man bought two suits of clothes, one costing \$$35\frac{3}{4}$ and the other \$$28\frac{1}{2}$. How much more did the one suit cost than the other?

75. James lives $1\frac{9}{20}$ miles from the schoolhouse, and Samuel $1\frac{4}{5}$ miles away. How much farther does Samuel have to walk to school than James?

REVIEW

1. A newsboy earned \$$\frac{2}{5}$ one day, \$$\frac{3}{10}$ another day, and \$$\frac{1}{2}$ a third day. How much did he earn in the 3 days?

2. A stick was broken into two pieces — one $3\frac{3}{4}$ ft. long and the other $1\frac{3}{4}$ ft. long. How long was the whole stick?

3. If a man earns \$$3\frac{2}{5}$ a day, and a boy \$$\frac{3}{4}$ a day, how much more does the man earn in a day than the boy?

4. What will be the total cost of 1 sack of flour \$$1\frac{3}{5}$, sugar \$$\frac{1}{4}$, dried beef \$$\frac{3}{10}$, and corned beef \$$\frac{1}{2}$?

5. A boy is 4 ft. 5 in. tall. His sister is 3 ft. 5 in. tall. How much taller is the boy than his sister?

6. The top of a door is $12\frac{1}{2}$ feet above the ground, and the bottom of it is $4\frac{3}{4}$ feet above the ground. How high is the door?

7. Four loads of coal weighed as follows: 2 tons, $1\frac{3}{4}$ tons, $2\frac{1}{4}$ tons, and $2\frac{1}{2}$ tons. How much did the four loads weigh?

8. The rainfall in April was $4\frac{1}{10}$ inches, in May $3\frac{3}{4}$ inches, and in June $4\frac{1}{5}$ inches. What was the total rainfall for the three months?

9. From a barrel containing $51\frac{1}{2}$ gallons of oil, $17\frac{1}{2}$ gallons were sold in one day, and $25\frac{1}{2}$ gallons another day. How many gallons remained unsold?

10. A station agent who was paid \$60 per month spent in one month \$$12\frac{2}{5}$ for groceries, \$$7\frac{7}{10}$ for meat, and \$$15\frac{1}{4}$ for other expenses. How much did he save?

11. A farmer drives in one day $12\frac{3}{4}$ miles, then $6\frac{7}{8}$ miles, and then $9\frac{1}{2}$ miles. How far does he drive?

12. To the sum of $22\frac{6}{7}$ and $15\frac{3}{4}$ add their difference.

13. From $38\frac{5}{24}$ take the sum of $16\frac{7}{8}$ and $12\frac{11}{12}$.

14. The feed for a horse cost \$$5\frac{3}{4}$ per month; for a cow \$$4\frac{1}{5}$ per month. If a man has 2 horses and 2 cows, how much will it cost to feed them a month?

15. A boy walked from his home east along a certain road $1\frac{7}{8}$ miles. He then walked to a place $2\frac{1}{4}$ miles west of his home. How far had he walked when he got home?

16. A man purchased a chair for \$$4\frac{1}{5}$, a stove for \$$6\frac{1}{2}$, a table for \$$8\frac{1}{4}$, and a bookcase for \$12.00. How much did they cost?

17. When a grocer receives a \$10 bill in payment for sugar $\$\frac{3}{4}$, vegetables $\$1\frac{1}{10}$, fruits $\$\frac{4}{5}$, rice $\$\frac{1}{4}$, and cakes $\$1\frac{1}{5}$, how much change does he give?

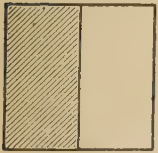
18. A student in the city in one month paid $\$4\frac{1}{10}$ for car fare, $\$18\frac{1}{2}$ for board, $\$7\frac{3}{4}$ for room, $\$2\frac{3}{5}$ for laundry, and $\$6\frac{1}{2}$ for books. How much did his expenses amount to during that month?

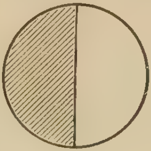
19. During the same month he earned \$30 by tutoring, $\$18\frac{1}{2}$ by selling books, and $\$12\frac{4}{5}$ by chemical work. How much did he have left after paying expenses?

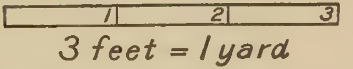
20. In 3 days in June the sun shone in New York $14\frac{2}{3}$ hours, $14\frac{3}{20}$ hours, and $14\frac{19}{30}$ hours. How many hours of sunshine were there in these 3 days? How many hours without sunshine were there?

MULTIPLICATION OF FRACTIONS

Multiplying a fraction by a whole number.







1. Into how many halves is the square divided?

2. Two times $\frac{1}{2}$ the square = —— square.

3. Two times $\$\frac{1}{2}$ = —— dollar.

4. Four times $\$\frac{1}{2}$ = —— dollars.

5. Five times $\$\frac{1}{2}$ = —— dollars.

6. Into how many feet is the yard divided?

7. What is one of these parts called?

8. What are two parts called?

9. $2 \times \frac{1}{3}$ of a yard = —— yard.

10. $6 \times \frac{1}{3}$ of a yard = —— yards.

11. $6 \times \frac{1}{2}$ of a circle = —— circles.

12. $12 \times \frac{1}{2}$ of a circle = —— circles.

13. $4 \times \frac{1}{2}$ is the same as $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$.

14. $6 \times \frac{1}{2} = \frac{6}{2}$, or 3. Therefore to multiply $\frac{1}{2}$ by 6, we say six times $\frac{1}{2} = \frac{6}{2}$, or 3.

Give products:

15. $8 \times \frac{1}{2}$
16. $12 \times \frac{1}{4}$
17. $6 \times \frac{2}{3}$
18. $7 \times \frac{3}{7}$
19. $10 \times \frac{3}{5}$
20. $9 \times \frac{2}{3}$
21. $8 \times \frac{3}{4}$
22. $9 \times \frac{9}{10}$
23. $6 \times \frac{4}{6}$
24. $8 \times \frac{8}{9}$
25. $7 \times \frac{4}{9}$
26. $12 \times \frac{8}{9}$
27. $4 \times \frac{7}{11}$
28. $8 \times \frac{3}{7}$
29. $11 \times \frac{7}{8}$
30. $3 \times \frac{7}{11}$
31. $12 \times \frac{4}{7}$
32. $5 \times \frac{7}{8}$
33. $6 \times \frac{4}{5}$
34. $6 \times \frac{8}{9}$

Finding fractional parts of whole numbers.

1. $\frac{1}{2}$ of 1 unit = —— unit.

2. $\frac{1}{2}$ of 2 units = —— unit.

3. $\frac{1}{2}$ of \$2 = —— dollar.

We have learned that we may divide a unit into any number of parts and then take any number of these parts; thus, $\frac{3}{4}$ of \$60 means that \$60 (60 units) is divided into 4 equal parts of \$15 each and that 3 of these parts, or \$45, are taken.

Since $\frac{1}{4}$ of \$60 = \$15, $\frac{3}{4}$ of \$60 = 3 × \$15, or \$45.

Find the following:

4. $\frac{3}{4}$ of \$24
5. $\frac{9}{10}$ of 60 horses
6. $\frac{2}{3}$ of 36 days
7. $\frac{4}{5}$ of 20 hours
8. $\frac{5}{9}$ of 36 minutes
9. $\frac{11}{12}$ of \$144
10. $\frac{6}{13}$ of 78 miles
11. $\frac{5}{11}$ of 44 rods
12. $\frac{7}{9}$ of 72 cents
13. $\frac{9}{11}$ of 99
14. $\frac{4}{15}$ of 75
15. $\frac{3}{7}$ of 84

16. If I wish to find $\frac{1}{3}$ of 4, into how many parts do I divide 4? How do I find one of these parts? Divide 4 by 3.

17. Explain what you mean by $\frac{1}{5}$ of a number; by $\frac{3}{4}$ of a number; by $\frac{2}{5}$ of a number.

18. Find $\frac{2}{3}$ of 4.

Solution. — $\frac{1}{3}$ of $4 = \frac{4}{3}$, and $\frac{2}{3}$ of $4 = 2 \times \frac{4}{3}$, or $\frac{8}{3} = 2\frac{2}{3}$.

Find the following:

19. $\frac{2}{3}$ of 7
20. $\frac{3}{4}$ of 9
21. $\frac{7}{8}$ of 12
22. $\frac{5}{9}$ of 8
23. $\frac{6}{7}$ of 10
24. $\frac{4}{5}$ of 3
25. $\frac{9}{10}$ of 12
26. $\frac{11}{15}$ of 8
27. $\frac{7}{11}$ of 8
28. $\frac{8}{5}$ of 9
29. $\frac{4}{11}$ of 12
30. $\frac{5}{3}$ of 7
31. $\frac{2}{7}$ of 20
32. $\frac{3}{7}$ of 6
33. $\frac{4}{5}$ of 9
34. $\frac{3}{8}$ of 11
35. $\frac{7}{9}$ of 10
36. $\frac{5}{8}$ of 12

37. Multiply $\frac{3}{4}$ by 8. Which number is the multiplier? Which number is the multiplicand? Observe that $\frac{3}{4}$ of 8 gives the same result.

We find a fractional part of a number by **partition.**

If the sign of multiplication is written after a fractional multiplier, it may be read "of." Thus, $\frac{3}{4} \times 12$ may be read "$\frac{3}{4}$ of 12."

Read the following problems:

38. $\frac{2}{3} \times 9$ **39.** $\frac{3}{4} \times 6$ **40.** $\frac{7}{8} \times 4$ **41.** $\frac{6}{7} \times 6$

Written Work

1. A merchant owing $1200 gave his check for $\frac{3}{4}$ of the amount. For how much did he write his check?

2. Three men own 2500 acres of land. The first owns $\frac{2}{5}$ of it, the second $\frac{2}{3}$ of the remainder, and the third the remainder. How many acres does each own?

3. If a laborer works $\frac{4}{5}$ of the days in a common year, how many days does he work?

4. A student's expenses at college are $480 per year. If board and tuition cost $\frac{2}{3}$ of that amount, how much is spent for room rent, books, etc.?

5. A contractor agrees to erect a building for $24,570. Labor costs $\frac{1}{3}$ of the amount, material $\frac{2}{3}$ of the remainder. Find his profit.

6. $\frac{5}{8}$ of the entire enrollment of 14,720 in school are girls. Find the number of girls and the number of boys.

7. $\frac{7}{16}$ of $960 is paid in a year for rent. Find the monthly rent bill.

8. An automobile cost $3456 and the expenses and repairs for one year were $\frac{3}{16}$ of the cost. Find the expenses.

9. A western farmer bought a farm of 160 acres at $25 an acre. He erected a house costing $\frac{3}{10}$ as much as the land, and a barn costing $\frac{1}{2}$ as much as the house. Find the total cost of the property.

Finding a number when a fractional part of it is given.

1. $\frac{2}{3}$ of a flock of sheep are 40. Find the number in the flock.

Solution. — Since *two* thirds of the flock equal 40 sheep, *one* third of the flock equals $\frac{1}{2}$ of 40 sheep, or 20 sheep, and *three* thirds, or the flock, equal 3×20 sheep, or 60 sheep.

Find the number when:

2. $\frac{2}{3}$ of a number $= 12$

3. $\frac{3}{4}$ of a number $= 9$

4. $\frac{5}{9}$ of a number $= 15$

5. $\frac{7}{8}$ of a number $= 21$

6. $\frac{3}{7}$ of a number $= 18$

7. $\frac{6}{7}$ of a number $= 12$

8. $\frac{9}{11}$ of a number $= 36$

9. $\frac{12}{13}$ of a number $= 60$

10. $\frac{5}{8}$ of a number $= 45$

11. $\frac{9}{16}$ of a number $= 54$

Written Work

1. There are 18 girls in a school. This number is $\frac{2}{3}$ of all the pupils in the school. How many pupils are there in the school?

2. James deposited $18 in a savings bank, which was $\frac{3}{4}$ of what he earned during the month. How much did he earn in the month?

3. May spelled correctly 27 words, which were $\frac{9}{10}$ of all the words given. How many words were given?

4. A farmer sold 42 lambs, which were $\frac{6}{7}$ of his flock. How many lambs had he at first?

5. John has attended school 40 days, which are $\frac{2}{9}$ of the number of days in the term. Find the number of days in the term.

6. Mr. Tanner pays $30 each quarter for his telephone. At the same rate, how much does he pay in a year?

7. $500 is $\frac{5}{6}$ of a teacher's salary. Find her salary.

5 of the six parts of her salary = $500.
1 part = $\frac{1}{5}$ of $500, or $100.
6 parts, or her salary = 6 × $100 = $600.

8. Mr. Arnold bought a horse and a cow. He paid $50 for the cow, which was $\frac{2}{7}$ of what the horse cost. How much did they both cost?

9. A traveling salesman drove 18 miles one day. This was $\frac{3}{11}$ as far as he rode on a train. How far did he ride on the train?

10. The cost of a barn was $\frac{2}{9}$ as much as the cost of a house. If the barn cost $920, how much did they both cost?

11. The distance from New York to Harrisburg, Pa., is 195 miles. This is $\frac{15}{34}$ of the distance from New York to Pittsburg. What is the latter distance?

12. A steel rail is 30 feet long. This is $\frac{5}{12}$ of the length of a Pullman car. What is the length of a Pullman?

Multiplying a mixed number by an integer.

Analyze these problems:

1. Find the cost of 6 eggs at $3\frac{1}{2}$ cents a piece.

2. Find the cost of 4 qt. of oil at $4\frac{1}{2}$ cents per qt.

3. How much will 8 lb. of rice cost at $6\frac{1}{2}$ cents per lb.?

4. Find the cost of 12 lb. of sugar at $6\frac{1}{2}$ cents per lb.

5. When berries are sold for $8\frac{1}{2}$ cents per basket, find the cost of 6 baskets.

6. A man earns $\$1\frac{3}{4}$ per day. How much does he earn in 6 days?

7. When apples are sold for $\$1\frac{1}{4}$ per bushel, find the cost of 8 bushels.

8. Mary pays $\$\frac{3}{4}$ for music lessons and takes two lessons per week. How much do her music lessons cost her in 4 weeks?

9. John makes $\frac{3}{8}$ of a cent on each paper and averages 40 papers each day for six days. Find his profit.

10. We pay $7\frac{1}{2}$¢ per qt. for milk. How much is our milk bill in 4 weeks, if we use 2 qt. per day?

SUGGESTION. — Find the bill for each day; then for each week; and then for the number of weeks.

11. By buying 25 cents worth of street car tickets, each ticket costs me $4\frac{1}{6}$ cents. Find the cost of 12 tickets.

12. A storekeeper makes $1\frac{2}{3}$ cents on each can of corn. How much does he make on 18 cans?

13. John works for $5\frac{1}{2}$ cents per hour. If he works 8 hours a day, how much does he earn in 2 days?

14. Mary uses $1\frac{2}{3}$ yd. of ribbon for a bow. How much does it take for 9 such bows?

15. Find the cost of a dozen eggs at $3\frac{1}{3}$ cents apiece.

16. I pay $\$5\frac{3}{4}$ for a boy's suit. Find the cost of 4 such suits.

17. 3 baskets of cherries cost 25 cents. How much will 12 baskets cost?

SUGGESTION. — 12 baskets will cost how many times the cost of 3 baskets?

Written Work

1. Find $6 \times 1\frac{1}{2}$.

$$\begin{array}{l} 1\frac{1}{2} \\ \underline{6\phantom{\frac{1}{2}}} \\ 3 = 6 \times \frac{1}{2} \\ \underline{6\phantom{\frac{1}{2}}} \\ 9 \end{array}$$

This means that $6 \times \frac{1}{2}$ is to be added to 6×1.
$6 \times \frac{1}{2} = \frac{6}{2}$ or 3; $6 \times 1 = 6$; and $3 + 6 = 9$.

Find the value of:

2. $8 \times 4\frac{1}{2}$
3. $10 \times 4\frac{1}{2}$
4. $9 \times 2\frac{2}{3}$
5. $12 \times 3\frac{3}{4}$
6. $11 \times 3\frac{3}{11}$
7. $14 \times 2\frac{2}{7}$
8. $12 \times 8\frac{1}{2}$
9. $6 \times 8\frac{1}{2}$
10. $5 \times 3\frac{3}{5}$
11. $10 \times 2\frac{2}{5}$
12. $12 \times 3\frac{3}{4}$
13. $20 \times 5\frac{2}{5}$
14. $45 \times 12\frac{7}{9}$
15. $120 \times 22\frac{3}{8}$
16. $154 \times 11\frac{6}{7}$
17. $96 \times 6\frac{2}{3}$
18. $144 \times 9\frac{1}{6}$
19. $80 \times 4\frac{1}{2}$
20. $125 \times 18\frac{3}{5}$
21. $72 \times 24\frac{5}{9}$
22. $100 \times 14\frac{7}{10}$
23. $132 \times 5\frac{5}{11}$
24. $168 \times 10\frac{5}{12}$
25. $20 \times 18\frac{4}{5}$
26. $90 \times 15\frac{5}{6}$
27. $50 \times 16\frac{1}{2}$
28. $200 \times 15\frac{3}{20}$

29. A book dealer purchases 125 books at wholesale at \$ $1\frac{1}{5}$ each. Find the cost.

30. The car fare from Pittsburg to Chicago on the Ft. Wayne is \$ $10\frac{1}{2}$. Find the amount received from the sale of 50 tickets.

31. A newsdealer buys 300 papers at $1\frac{1}{4}$ cents each and sells them at 2 cents each. Find the cost and the gain.

32. A huckster buys 20 dozen bananas at 10 cents per dozen and sells them at the rate of 2 cents each. Find his gain.

33. A fruit dealer buys a barrel of apples for \$ $4\frac{1}{2}$. The barrel contains 240 apples. He sells one half of them at the rate of 2 for 5 cents and the remainder at the rate of 3 for 5 cents. Find his profit.

34. A merchant buys a roll of calico containing 40 yards at $5\frac{3}{4}$ cents per yard. Find the cost.

35. The merchant retails the calico at $7\frac{1}{2}$ cents per yard. Find the amount received for the roll.

36. A boy lives $1\frac{2}{3}$ miles from his school and attends 150 days in the term. How many miles does he walk in a term both to and from school?

37. A department store employs 100 cash girls at \$ $2\frac{3}{4}$ per week and 120 other clerks at \$ $4\frac{3}{4}$ per week. Find the amount paid to all.

38. If a man can cut an average of $2\frac{1}{4}$ cords of wood in a day, how many cords can he cut in 44 days?

39. A dealer in feed finds that a car load of 600 bushels of oats, after paying freight, damage, etc., costs $42\frac{7}{8}$ cents per bushel. Find the cost.

40. A contractor buys 20 thousand feet of lumber at \$ $20\frac{3}{4}$ per thousand and 16 thousand bricks at \$ $16\frac{1}{2}$ per thousand. Find his bill.

41. Find the cost of 24,000 railroad ties at $62\frac{1}{2}$¢ each.

42. When lead pencils are selling at \$$1\frac{3}{5}$ per gross (144), find the cost of 3550 gross.

43 Find the cost of sewing buttons on 72 suits, at $1\frac{7}{8}$¢ a suit.

44. A contractor averages $6\frac{7}{8}$ rd. a day in digging a sewer. How long is the sewer if it takes him 39 days to dig it?

45. A rural mail carrier travels $23\frac{7}{8}$ miles for each delivery. Find the number of miles traveled in 310 deliveries.

46. An ocean steamer burns on an average $201\frac{5}{16}$ tons of coal in a day. How much coal will it consume in a voyage of 7 days?

Multiplying an integer by a mixed number.

Analyze these problems:

1. Multiply 12 by $6\frac{3}{4}$; 10 by $7\frac{2}{5}$.

2. $7\frac{1}{2}$ times 8 hours are how many hours?

3. How much do $2\frac{3}{4}$ pounds of candy cost at 40 cents a pound?

4. I bought $4\frac{7}{8}$ yards of ribbon at 40 cents a yard. How much did it cost?

5. A boy walks 3 miles in an hour. How far can he walk at the same rate in $2\frac{5}{6}$ hours?

6. James is 6 years old. His mother is $4\frac{5}{6}$ times as old. How old is she?

7. How much will $10\frac{3}{4}$ pounds of meat cost at 16 cents a pound?

8. A man bought $7\frac{1}{2}$ gallons of oil at 12¢ a gallon. How much did he pay for it?

9. When gas costs 25 cents per thousand feet, what is my bill for $10\frac{3}{5}$ thousand feet?

10. If a lot cost $200 and a house $6\frac{5}{8}$ times as much, how much did the house cost?

11. A man worked $20\frac{3}{4}$ days in a month for $2 a day. How much did he earn?

12. How many inches equal $9\frac{3}{4}$ feet?

13. At 60 cents a bushel, how much will $2\frac{1}{2}$ bushels of wheat cost?

14. I bought $1\frac{3}{4}$ dozen collars at $2 per dozen. How much did they cost?

15. At 12 cents a pound, how much will $15\frac{3}{4}$ pounds of raisins cost?

16. How much will $5\frac{7}{8}$ bu. raspberries cost at $2 a bushel?

17. If a plumber is paid 75 cents per hour, how much does he receive in $3\frac{2}{5}$ hours?

18. How far will an automobile travel in $2\frac{1}{2}$ hours if it travels 18 miles in one hour?

19. If the freight from New York to Albany on a ton of merchandise is 33 cents, how much will it be on $5\frac{8}{11}$ tons?

20. A gallon of water weighs 8 pounds. How much do $10\frac{3}{4}$ gallons weigh?

Written Work

1. Multiply 12 by $18\frac{1}{6}$.

$$\begin{array}{l} 12 \\ \underline{18\frac{1}{6}} \\ \;\;2 = \frac{1}{6} \times 12 \\ \;96 \\ \underline{12} \\ 218 \end{array}$$

$18\frac{1}{6}$ times 12 means that $\frac{1}{6}$ of 12 is to be added to 18×12. $\frac{1}{6}$ of $12 = 2$, which added to $18 \times 12 = 218$.

2. Multiply 12 by $14\frac{2}{3}$.

$$\begin{array}{rl} 12 & \\ 14\frac{2}{3} & \\ \hline 8 & = \frac{2}{3} \text{ of } 12 \\ 48 & \\ 12 & \\ \hline 176 & \end{array}$$

$14\frac{2}{3}$ times 12 means that $\frac{2}{3}$ of 12 is to be **added** to 14×12. $\frac{2}{3}$ of $12 = 8$, which added to $14 \times 12 = 176$.

Find products:

3. $7\frac{1}{2} \times 6$
4. $15\frac{1}{3} \times 9$
5. $27\frac{1}{6} \times 12$
6. $120\frac{1}{8} \times 40$
7. $216\frac{1}{10} \times 50$
8. $73\frac{1}{3} \times 15$
9. $140\frac{1}{4} \times 28$
10. $100\frac{1}{10} \times 60$
11. $95\frac{1}{5} \times 45$
12. $81\frac{1}{7} \times 21$
13. $120\frac{1}{9} \times 81$
14. $144\frac{1}{2} \times 108$
15. $150\frac{1}{15} \times 60$
16. $180\frac{1}{18} \times 18$
17. $20\frac{1}{20} \times 100$
18. $42\frac{1}{11} \times 55$
19. $64\frac{1}{13} \times 39$
20. $72\frac{1}{14} \times 42$
21. $102\frac{1}{16} \times 80$
22. $124\frac{1}{24} \times 120$
23. $12\frac{2}{3} \times 9$
24. $14\frac{2}{5} \times 10$
25. $20\frac{3}{4} \times 12$
26. $35\frac{5}{6} \times 18$
27. $95\frac{1}{7} \times 42$
28. $100\frac{3}{5} \times 20$
29. $124\frac{1}{8} \times 120$
30. $65\frac{3}{8} \times 32$
31. $116\frac{2}{9} \times 54$
32. $112\frac{3}{10} \times 50$
33. $88\frac{3}{7} \times 28$
34. $30\frac{5}{8} \times 160$
35. $19\frac{7}{12} \times 24$
36. $3\frac{7}{15} \times 60$
37. $145\frac{3}{11} \times 55$
38. $48\frac{6}{7} \times 84$
39. $21\frac{3}{4} \times 16$
40. $40\frac{4}{5} \times 25$
41. $121\frac{6}{7} \times 49$
42. $10\frac{8}{9} \times 18$
43. $14\frac{7}{8} \times 24$
44. $20\frac{1}{12} \times 84$

45. If the rate of sailing of a vessel is 18 miles an hour, how far will it sail in $24\frac{1}{3}$ hours?

46. Find the cost of $12\frac{1}{4}$ tons of coal at $6 a ton.

47. Find the cost of $16\frac{1}{2}$ yards of silk at $1.50 a yard.

48. A farmer sold $5\frac{1}{2}$ acres of land at $40 an acre. How much did he receive for it?

49. If ribbon is sold at 24 cents a yard, how much will $7\frac{3}{4}$ yards cost?

50. At 16 cents a pound, how much will $10\frac{7}{8}$ pounds of cheese cost?

51. If clover seed is selling at \$8 a bushel, how much will $11\frac{3}{4}$ bushels cost?

52. Find the cost of $5\frac{3}{4}$ yards of point lace at \$24 a yard.

53. When hay is selling for \$12 a ton, how much must I pay for $16\frac{3}{4}$ tons?

54. If a boy walks 18 miles in a day, how far can he walk in $36\frac{2}{3}$ days?

55. Mr. Penrose sold his farm containing $85\frac{7}{8}$ acres at \$56 an acre. How much did he receive for it?

56. Find the cost of $15\frac{3}{4}$ yards of velvet at \$5 a yard.

Multiplying a fraction by a fraction.

1. What is $\frac{1}{3}$ of 6 feet? $\frac{2}{3}$ of 6 feet?

2. What is $\frac{1}{3}$ of 6 sevenths? $\frac{2}{3}$ of $\frac{6}{7}$?

3. $\frac{1}{3}$ of $\frac{6}{7}$ means that we are to take $\frac{1}{3}$ of 6 equal parts of a unit that has been divided into 7 equal parts.

4. $\frac{1}{3}$ of $\frac{6}{7}$ = how many sevenths?

5. $\frac{1}{3}$ of $\frac{6}{7} = \frac{2}{7}$, and $\frac{2}{3}$ of $\frac{6}{7} = 2$ times $\frac{2}{7}$, or $\frac{4}{7}$.

Find:

6. $\frac{1}{2}$ of $\frac{4}{5}$

7. $\frac{1}{4}$ of $\frac{8}{9}$

8. $\frac{1}{5}$ of $\frac{5}{6}$

9. $\frac{2}{3}$ of $\frac{4}{7}$

10. $\frac{3}{4}$ of $\frac{8}{9}$

11. $\frac{3}{5}$ of $\frac{5}{8}$

12. $\frac{2}{5}$ of $\frac{10}{11}$

13. $\frac{4}{5}$ of $\frac{20}{21}$

14. $\frac{5}{6}$ of $\frac{24}{25}$

15. What is $\frac{2}{3}$ of $\frac{3}{5}$? $\frac{1}{3}$ of $\frac{3}{5} = \frac{1}{5}$, and $\frac{2}{3}$ of $\frac{3}{5} = 2$ times $\frac{1}{5}$, or $\frac{2}{5}$.

16. Observe that $\frac{2}{3}$ of $\frac{3}{5} = \frac{2 \times 3}{3 \times 5} = \frac{6}{15}$, or $\frac{2}{5}$.

Written Work

1. Find $\frac{3}{5}$ of $\frac{4}{7}$. This means $\frac{3}{5} \times \frac{4}{7} = \frac{12}{35}$.

Find products:

2. $\frac{5}{8} \times \frac{5}{9}$
3. $\frac{4}{7} \times \frac{8}{9}$
4. $\frac{4}{5} \times \frac{4}{7}$
5. $\frac{3}{8} \times \frac{5}{8}$
6. $\frac{5}{6} \times \frac{8}{11}$
7. $\frac{6}{7} \times \frac{9}{10}$
8. $\frac{8}{9} \times \frac{6}{7}$
9. $\frac{4}{5} \times \frac{8}{9}$
10. $\frac{5}{7} \times \frac{4}{9}$
11. $\frac{3}{11} \times \frac{5}{6}$
12. $\frac{2}{7} \times \frac{6}{7}$
13. $\frac{3}{5} \times \frac{9}{10}$

14. Find $1\frac{1}{2} \times 1\frac{3}{4}$. Change to improper fractions. Thus, $1\frac{1}{2} \times 1\frac{3}{4} = \frac{3}{2} \times \frac{7}{4} = \frac{21}{8}$, or $2\frac{5}{8}$.

15. $1\frac{2}{3} \times 2\frac{1}{2}$
16. $3\frac{1}{2} \times 2\frac{2}{5}$
17. $3\frac{1}{3} \times 1\frac{1}{3}$
18. $4\frac{1}{3} \times 2\frac{1}{2}$
19. $1\frac{1}{8} \times 2\frac{1}{4}$
20. $3\frac{3}{4} \times 1\frac{1}{2}$
21. $4\frac{3}{5} \times 7\frac{1}{4}$
22. $9\frac{2}{3} \times 12\frac{1}{2}$
23. $6\frac{1}{4} \times 9\frac{3}{4}$
24. $12\frac{1}{2} \times 4\frac{1}{5}$
25. $10\frac{2}{3} \times 3\frac{1}{8}$
26. $12\frac{1}{2} \times 12\frac{1}{2}$

27. Find the cost of $3\frac{1}{2}$ quarts of milk at $7\frac{1}{2}$¢ per quart.

28. A lady bought $18\frac{3}{4}$ yards of gingham at $8\frac{1}{2}$¢ per yard. Find the cost.

29. When copper is selling at $16\frac{3}{4}$¢ per pound, find the cost of $8\frac{1}{2}$ pounds.

REVIEW

1. Find the cost of 2 dozen cans of tomatoes at $8\frac{1}{3}$ cents per can.

2. How much does a motorman earn in $13\frac{1}{2}$ hours at 22¢ per hour?

3. When copper is selling at $16\frac{3}{4}$ cents per pound, find the cost of 36 pounds.

4. If platinum is selling at \$$19\frac{3}{4}$ per ounce, find the cost of 7 ounces.

5. Find the cost of 21 tons of anthracite coal at \$$6\frac{3}{4}$ per ton.

6. A load of soft coal contains 50 bushels. How much is it worth at $7\frac{1}{2}$ ¢ per bushel?

7. When apples are selling at \$.64 a bushel, find the cost of $12\frac{3}{4}$ bushels.

8. At $8\frac{3}{8}$ cents per pound, how much is the expressage on a package weighing 48 pounds?

9. If a bale of cotton weighs $475\frac{3}{4}$ pounds, how much is it worth at 8 cents per pound?

10. How much will $17\frac{1}{2}$ quarts of ice cream cost at 20 cents per quart?

11. When hay is selling at \$$8\frac{3}{4}$ per ton, find the cost of $34\frac{1}{2}$ tons.

12. From a piece of carpet containing 61 yd., $19\frac{3}{4}$ yd. were sold at 70 ¢ a yard, $17\frac{1}{2}$ yd. at 65 ¢ a yard, and the remainder at 55 ¢ a yard. For how much was the whole piece sold?

13. If the above piece of carpet cost 45 ¢ a yard, find the entire gain.

14. Find the weight of 14 bags of coffee if each bag weighs $47\frac{3}{8}$ pounds.

15. At $8\frac{7}{8}$ miles per hour, how far does a steamboat travel in 16 hours?

16. The rate in example 15 is the rate downstream. Upstream the rate is $2\frac{3}{4}$ miles per hour less. How far would the boat travel upstream in 24 hours?

CANCELLATION

1. Find $\frac{2}{3}$ of $\frac{3}{5}$.

$\frac{2}{3}\times\frac{3}{5}=\frac{6}{15}$, or $\frac{2}{5}$

$$\frac{2\times\cancel{3}}{\cancel{3}\times 5}=\frac{2}{5}$$

In changing $\frac{6}{15}$ to $\frac{2}{5}$ both terms of the fraction are divided by 3. Hence, in finding the value of $\frac{2\times 3}{3\times 5}$ the work may be shortened by rejecting the factor 3 from both dividend and divisor, as indicated in the second model.

Cancellation is the process of shortening operations by striking out equal factors from both dividend and divisor.

Cancel equal factors from both dividend and divisor when possible; thus, $\frac{2}{3}\times 7\frac{1}{2}\times 3=\frac{\cancel{2}}{\cancel{3}}\times\frac{\overset{5}{\cancel{15}}}{\cancel{2}}\times\frac{3}{1}=\frac{15}{1}=15.$

2. $\frac{5}{8}\times 2\frac{2}{7}\times 2$

3. $1\frac{3}{7}\times 4\frac{3}{8}\times 1\frac{1}{2}$

4. $4\times 2\frac{1}{2}\times 1\frac{1}{5}$

5. $\frac{7}{9}\times 3\times 4\frac{1}{2}$

6. $3\times\frac{2}{3}$ of $\frac{3}{4}$

7. $5\frac{1}{2}\times 3\frac{1}{4}\times 4$

8. $6\frac{1}{8}\times 8\times 2\frac{1}{7}$

9. $5\frac{1}{4}\times 2\frac{1}{3}\times 4$

10. $\frac{2}{3}$ of $\frac{3}{4}\times 6\frac{1}{2}$

11. $\frac{7}{8}\times 8\times 12\frac{1}{7}$

12. $\frac{9}{10}$ of $3\frac{3}{4}\times 10$

13. $5\frac{1}{2}\times 2\frac{2}{11}\times 3\frac{1}{8}$

14. $5\times 3\frac{1}{5}\times 3\frac{3}{8}$

15. $16\frac{1}{5}\times 4\frac{1}{9}\times 3$

16. At $8\frac{3}{4}$ cents per pound, how much is the expressage on a package weighing 64 pounds?

17. At \$$9\frac{3}{5}$ a pair find the cost of 15 pairs of lace curtains.

18. At the rate of $33\frac{1}{4}$ miles an hour how far will a train travel in $10\frac{2}{3}$ hours?

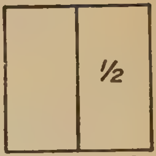
19. If a load of coal weighs $5\frac{3}{8}$ tons, find the cost at \$$6\frac{2}{5}$ per ton.

20. Where hay is selling at \$$12\frac{4}{5}$ per ton, find the cost of $6\frac{3}{8}$ tons.

DIVISION OF FRACTIONS

Dividing a whole number by a fraction.

1. How many halves are there in this square?



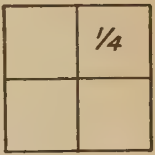
$1 \div \frac{1}{2} = 2$

2. How many times is $\frac{1}{2}$ contained in 1?

3. How many times is \$$\frac{1}{2}$ contained in \$1? in \$2? in \$4?

4. What is the quotient of *two* halves divided by *one* half? of $\frac{2}{2} \div \frac{1}{2}$? What is the quotient of *four* halves divided by *two* halves? of $\frac{4}{2} \div \frac{2}{2}$? of $\frac{6}{2} \div \frac{2}{2}$?

5. How many *fourths* are there in this square? What, then, is the quotient of 1 divided by $\frac{1}{4}$?



$1 \div \frac{1}{4} = 4$

6. How many \$$\frac{1}{4}$ are there in \$1? in \$3?

7. What is the quotient of *four* fourths divided by *one* fourth? of $\frac{4}{4} \div \frac{1}{4}$? What is the difference between the quotients of $1 \div \frac{1}{4}$ and $\frac{4}{4} \div \frac{1}{4}$? of $2 \div \frac{1}{4}$ and $\frac{8}{4} \div \frac{1}{4}$? of $3 \div \frac{1}{4}$ and $\frac{12}{4} \div \frac{1}{4}$?

8. Explain how $1 \div \frac{1}{4} = \frac{4}{4} \div \frac{1}{4}$; $2 \div \frac{1}{2} = \frac{4}{2} \div \frac{1}{2}$; $3 \div \frac{1}{4} = \frac{12}{4} \div \frac{1}{4}$; $\frac{2}{3} \div \frac{1}{4} = \frac{8}{12} \div \frac{3}{12}$, $\frac{5}{6} \div \frac{1}{5} = \frac{25}{30} \div \frac{6}{30}$.

Give quotients:

9. $2 \div \frac{1}{2}$
10. $4 \div \frac{1}{2}$
11. $5 \div \frac{1}{2}$
12. $2 \div \frac{1}{3}$
13. $4 \div \frac{1}{3}$
14. $3 \div \frac{1}{3}$
15. $5 \div \frac{1}{3}$
16. $6 \div \frac{1}{4}$
17. $6 \div \frac{1}{3}$
18. $8 \div \frac{1}{3}$
19. $5 \div \frac{1}{4}$
20. $4 \div \frac{1}{5}$
21. $12 \div \frac{1}{2}$
22. $10 \div \frac{1}{2}$
23. $9 \div \frac{1}{2}$
24. $6 \div \frac{1}{5}$
25. $12 \div \frac{1}{3}$
26. $4 \div \frac{1}{8}$
27. $15 \div \frac{1}{2}$
28. $2 \div \frac{1}{8}$
29. $4 \div \frac{1}{8}$
30. $5 \div \frac{1}{5}$
31. $16 \div \frac{1}{2}$
32. $10 \div \frac{1}{4}$

33. Change 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 each to 4ths; to 6ths; to 8ths; to 10ths. Thus, $1 = \frac{4}{4} = \frac{6}{6} = \frac{8}{8} = \frac{10}{10}$.

34. What change must be made in $\frac{4}{5}$ and $\frac{2}{3}$ before they can be added or their difference taken?

35. What change did we make in the problem $1 \div \frac{1}{4}$ before we divided 1 by $\frac{1}{4}$?

36. What change did we make in the fractions in example 8 before one fraction was divided by another fraction? This is the *first* step.

37. When the fractions have been made similar what is the *second* step in dividing the fractions? the *third* step?

Any number may be **divided by a fraction** *by changing both numbers to similar fractions and then dividing the numerators.*

Thus, $8 \div \frac{4}{5} = \frac{40}{5} \div \frac{4}{5} = 40 \div 4 = 10.$
$\frac{5}{8} \div \frac{1}{3} = \frac{15}{24} \div \frac{8}{24} = 15 \div 8 = 1\frac{7}{8}.$

38. Give quotients:

$\frac{4}{5} \div \frac{1}{5}$
$8 \div \frac{1}{4}$
$\frac{9}{12} \div \frac{1}{4}$
$\frac{8}{12} \div \frac{1}{3}$
$\frac{15}{20} \div \frac{1}{4}$
$\frac{12}{16} \div \frac{1}{4}$
$\frac{3}{12} \div \frac{1}{4}$
$\frac{9}{18} \div \frac{1}{6}$
$\frac{18}{36} \div \frac{1}{4}$
$\frac{24}{30} \div \frac{1}{5}$
$\frac{10}{14} \div \frac{1}{7}$
$\frac{18}{24} \div \frac{1}{4}$
$\frac{20}{25} \div \frac{1}{5}$
$\frac{12}{15} \div \frac{1}{3}$
$\frac{21}{35} \div \frac{1}{5}$
$\frac{24}{30} \div \frac{1}{6}$
$\frac{5}{7} \div \frac{5}{14}$
$\frac{3}{4} \div \frac{3}{12}$
$\frac{12}{21} \div \frac{2}{7}$
$\frac{4}{5} \div \frac{2}{20}$
$\frac{1}{2} \div \frac{4}{16}$
$\frac{9}{10} \div \frac{3}{20}$
$\frac{7}{8} \div \frac{2}{16}$
$\frac{2}{3} \div \frac{4}{12}$

39. Give quotients:

$4 \div \frac{1}{3}$
$5 \div \frac{2}{3}$
$2 \div \frac{7}{8}$
$\frac{1}{2} \div \frac{1}{4}$
$\frac{3}{8} \div \frac{1}{8}$
$12 \div \frac{3}{4}$
$\frac{3}{5} \div \frac{4}{5}$
$\frac{12}{16} \div \frac{1}{8}$
$\frac{24}{30} \div \frac{1}{6}$
$\frac{20}{25} \div \frac{2}{5}$
$\frac{15}{20} \div \frac{3}{4}$
$\frac{5}{8} \div \frac{5}{12}$
$\frac{7}{9} \div \frac{1}{3}$
$\frac{1}{10} \div \frac{1}{3}$
$\frac{1}{3} \div \frac{1}{4}$
$\frac{1}{4} \div \frac{1}{3}$
$\frac{6}{7} \div \frac{2}{3}$
$\frac{9}{18} \div \frac{5}{6}$
$\frac{3}{5} \div \frac{1}{4}$
$\frac{4}{9} \div \frac{2}{7}$
$\frac{1}{8} \div \frac{1}{7}$
$\frac{8}{9} \div \frac{4}{9}$
$\frac{3}{10} \div \frac{7}{10}$
$\frac{18}{36} \div \frac{3}{4}$

Dividing a whole number or a mixed number by a fraction.

An **improper fraction** is a fraction whose numerator is equal to or greater than its denominator; as, $\frac{4}{4}$, $\frac{4}{3}$, $\frac{6}{6}$, $\frac{7}{6}$.

A **proper fraction** is a fraction whose numerator is less than its denominator; as, $\frac{3}{4}$, $\frac{2}{4}$, $\frac{5}{6}$.

Change $4\frac{1}{2}$, $5\frac{1}{3}$, $2\frac{2}{3}$, $5\frac{1}{5}$, $7\frac{1}{8}$, to improper fractions.

Written Work

1. Divide $4\frac{1}{2}$ by $\frac{3}{4}$.

$$\begin{array}{l} 4\frac{1}{2} = \frac{9}{2} \\ 4 \quad = \text{c. d.} \\ \hline \frac{9}{2} \div \frac{3}{4} = \\ \hline \frac{18}{4} \div \frac{3}{4} = 6 \end{array}$$

Change $4\frac{1}{2}$ to the improper fraction $\frac{9}{2}$. Change $\frac{9}{2}$ and $\frac{3}{4}$ to similar fractions. $\frac{9}{2} = \frac{18}{4}$, $\frac{3}{4} = \frac{3}{4}$, $\frac{18}{4} \div \frac{3}{4} = 18 \div 3$, or 6.

Divide:

2. $6 \div \frac{1}{3}$
3. $3\frac{3}{4} \div \frac{2}{3}$
4. $5 \div \frac{1}{2}$
5. $2\frac{1}{2} \div \frac{3}{4}$
6. $2\frac{1}{8} \div \frac{1}{2}$
7. $3\frac{1}{3} \div \frac{1}{5}$
8. $1\frac{4}{5} \div \frac{9}{10}$
9. $10 \div \frac{1}{4}$
10. $8 \div \frac{2}{3}$
11. $12 \div 3\frac{1}{5}$
12. $6 \div \frac{4}{5}$
13. $1\frac{2}{3} \div \frac{2}{3}$
14. $1\frac{7}{8} \div \frac{3}{4}$
15. $2\frac{1}{5} \div \frac{3}{4}$
16. $6 \div \frac{2}{3}$
17. $3\frac{1}{2} \div \frac{7}{8}$
18. $5\frac{3}{8} \div \frac{3}{4}$
19. $8\frac{4}{9} \div 2\frac{2}{3}$

20. How much are eggs per dozen when 36 cents are paid for $2\frac{1}{4}$ dozen?

21. A man's wages amounted to 46 dollars for $9\frac{1}{5}$ days' work. How much did he receive per day?

22. A piece of ribbon containing 10 yards is cut into badges each $\frac{1}{3}$ of a yard in length. How many badges can be cut from the piece?

23. A merchant sold 81 cents' worth of ribbon. If he sold $6\frac{3}{4}$ yards, what was the price per yard?

Dividing a mixed number by a mixed number.

Written Work

1. Divide $1\frac{1}{2}$ by $1\frac{1}{3}$

$$\frac{6 = \text{c. d.}}{\underline{1\frac{1}{2} \div 1\frac{1}{3}}}$$
$$\frac{9}{6} \div \frac{8}{6} = 9 \div 8, \frac{9}{8} \text{ or } 1\frac{1}{8}$$

First change the mixed numbers to improper fractions, then make the fractions similar, and divide the numerator of the dividend by the numerator of the divisor.

2. $7\frac{1}{2} \div 2\frac{1}{2}$
3. $6\frac{2}{3} \div 1\frac{2}{3}$
4. $5\frac{1}{4} \div 1\frac{3}{4}$
5. $8\frac{2}{3} \div 2\frac{1}{6}$
6. $7\frac{1}{3} \div 1\frac{1}{6}$
7. $3\frac{1}{3} \div 2\frac{1}{2}$
8. $12\frac{1}{2} \div 6\frac{1}{4}$
9. $14\frac{2}{7} \div 2\frac{6}{7}$
10. $3\frac{1}{4} \div 2\frac{1}{2}$
11. $5\frac{2}{3} \div 4\frac{1}{5}$
12. $6\frac{1}{8} \div 7\frac{1}{4}$
13. $8\frac{1}{3} \div 9\frac{1}{6}$
14. $3\frac{1}{6} \div 9\frac{1}{2}$
15. $3\frac{3}{7} \div 3\frac{1}{7}$
16. $8\frac{3}{5} \div 6\frac{1}{7}$
17. $9\frac{1}{6} \div 3\frac{1}{2}$
18. $3\frac{9}{10} \div 2\frac{3}{5}$
19. $6\frac{1}{2} \div 4\frac{1}{6}$

20. At $2\frac{5}{8}$ dollars each, how many vests can be bought for \$42?

21. At \$$1\frac{1}{2}$ apiece, how many pictures can be bought for \$$10\frac{1}{2}$?

22. I paid \$$28\frac{4}{5}$ for cloth at \$$1\frac{1}{5}$ a yard. How many yards did I buy?

23. I spent \$$17\frac{3}{5}$ for molasses at \$$1\frac{1}{10}$ a gallon. How many gallons did I buy?

24. At \$$1\frac{1}{5}$ each, how many straw hats can be bought for \$$14\frac{2}{5}$?

25. A merchant purchases \$$50\frac{2}{5}$ worth of gas lamps at \$$4\frac{1}{5}$ a piece. Find the number purchased.

26. When $3\frac{1}{4}$ bushels of apples cost \$$2\frac{3}{5}$, how much will one bushel cost?

27. A man earns \$ $16\frac{1}{2}$ in $5\frac{1}{2}$ days. How much is this per day?

28. At \$$2\frac{1}{2}$ per pair, how many pairs of shoes can be bought for \$$17\frac{1}{2}$?

Dividing any number by a fraction by inverting the terms of the divisor.

1. How many times is $\frac{1}{2}$ inch contained in 1 inch? $\frac{1}{3}$ yard in 1 yard? $\frac{1}{4}$ foot in 1 foot? Draw figures to illustrate.

When the fraction $\frac{1}{2}$ is changed to $\frac{2}{1}$, the fraction is said to be **inverted.** It then shows how many times the fraction is contained in 1.

2. $1 \div \frac{1}{2} =$ —— $1 \div \frac{1}{4} =$ —— $1 \div \frac{1}{5} =$ ——

3. $1 \div \frac{1}{6} =$ —— $1 \div \frac{1}{7} =$ —— $1 \div \frac{1}{8} =$ ——

Observe that in each of the above problems the quotient equals $1 \times$ *the fraction inverted.*

Thus: $1 \div \frac{1}{2} = 1 \times \frac{2}{1}$, or 2; $1 \div \frac{1}{4} = 1 \times \frac{4}{1}$, or 4.

4. Since $1 \div \frac{1}{2} = 1 \times \frac{2}{1}$, or 2, then $1 \div \frac{2}{4} = 1 \times \frac{4}{2}$, or 2.

How many times is $\frac{3}{6}$ contained in 1? $\frac{4}{8}$? $\frac{5}{10}$? $\frac{3}{4}$? $\frac{4}{5}$? $\frac{7}{8}$?

The number of times each of the above fractions is contained in 1 equals the number of times the numerator of each fraction is contained in its denominator.

Find quotients by inverting the divisor and multiplying:

Thus: $3 \div \frac{4}{5} = 3 \times \frac{5}{4} = \frac{15}{4} = 3\frac{3}{4}$.

5. $1 \div \frac{1}{4}$
6. $1 \div \frac{2}{4}$
7. $1 \div \frac{2}{3}$
8. $1 \div \frac{7}{8}$
9. $1 \div \frac{3}{4}$
10. $1 \div \frac{3}{5}$
11. $1 \div \frac{5}{6}$
12. $2 \div \frac{2}{3}$
13. $3 \div \frac{3}{4}$
14. $4 \div \frac{4}{5}$
15. $5 \div \frac{5}{6}$
16. $6 \div \frac{7}{8}$
17. $9 \div \frac{9}{10}$
18. $10 \div \frac{4}{9}$
19. $8 \div \frac{7}{8}$
20. $16 \div \frac{3}{4}$
21. $24 \div \frac{4}{5}$
22. $20 \div \frac{4}{5}$
23. $15 \div \frac{3}{5}$
24. $30 \div \frac{2}{3}$
25. $12 \div \frac{5}{6}$
26. $15 \div \frac{3}{4}$
27. $16 \div \frac{2}{3}$
28. $12 \div \frac{4}{9}$
29. $8 \div \frac{7}{12}$
30. $7 \div \frac{8}{15}$
31. $6 \div \frac{5}{9}$
32 $9 \div \frac{7}{9}$

Written Work

1. Divide 128 by $\frac{16}{25}$.

$$128 \div \frac{16}{25} = \overset{8}{\cancel{128}} \times \frac{25}{\cancel{16}} = 200$$

Since $\frac{16}{25}$ is contained in 1, $\frac{25}{16}$ times, $\frac{16}{25}$ is contained in 128, 128 × $\frac{25}{16}$, or 200 times.

Any number may be **divided by a fraction** *by inverting the terms of the divisor and multiplying.*

Divide:

2. 18 by $\frac{2}{3}$
3. 25 by $\frac{5}{8}$
4. 28 by $\frac{7}{9}$
5. 21 by $\frac{3}{7}$
6. 36 by $\frac{9}{10}$
7. 42 by $\frac{6}{11}$
8. 54 by $\frac{6}{7}$
9. 63 by $\frac{7}{8}$
10. 72 by $\frac{8}{9}$
11. 84 by $\frac{21}{25}$
12. 90 by $\frac{15}{16}$
13. 108 by $\frac{12}{13}$
14. 84 by $\frac{7}{12}$
15. 96 by $\frac{8}{9}$
16. 288 by $\frac{24}{5}$
17. 400 by $\frac{16}{9}$
18. 285 by $\frac{15}{9}$
19. 546 by $\frac{21}{35}$
20. 425 by $\frac{25}{12}$
21. 378 by $\frac{14}{15}$
22. 324 by $\frac{9}{14}$

23. Divide 36 by $3\frac{3}{5}$.

Suggestion. — Change the divisor to an improper fraction.

Divide:

24. 27 by $2\frac{1}{4}$
25. 33 by $3\frac{2}{3}$
26. 44 by $4\frac{2}{5}$
27. 60 by $3\frac{3}{4}$
28. 76 by $4\frac{3}{4}$
29. 60 by $6\frac{2}{3}$
30. 84 by $4\frac{1}{5}$
31. 75 by $2\frac{7}{9}$
32. 90 by $3\frac{3}{4}$
33. 92 by $2\frac{3}{10}$
34. 85 by $1\frac{8}{9}$
35. 245 by $5\frac{5}{6}$
36. 780 by $7\frac{4}{5}$
37. 355 by $8\frac{7}{8}$
38. 295 by $6\frac{5}{9}$
39. 748 by $3\frac{2}{3}$
40. 549 by $8\frac{5}{7}$
41. 620 by $7\frac{3}{4}$

Divide:

42. $11\frac{3}{5}$ by $3\frac{2}{9}$
43. $6\frac{3}{8}$ by $1\frac{8}{9}$
44. $10\frac{6}{9}$ by $2\frac{2}{11}$
45. $4\frac{8}{15}$ by $1\frac{5}{12}$
46. $7\frac{7}{12}$ by $1\frac{3}{4}$
47. $7\frac{3}{5}$ by $2\frac{3}{8}$
48. $10\frac{4}{5}$ by $2\frac{4}{7}$
49. $15\frac{5}{8}$ by $2\frac{7}{9}$
50. $12\frac{3}{4}$ by $5\frac{2}{3}$

MISCELLANEOUS PROBLEMS

Divide:

1. $5\frac{1}{10}$ by $3\frac{2}{5}$
2. $9\frac{3}{7}$ by $4\frac{5}{7}$
3. $16\frac{1}{9}$ by $6\frac{4}{9}$
4. $21\frac{1}{5}$ by $14\frac{2}{15}$
5. $9\frac{6}{11}$ by $8\frac{3}{4}$
6. $55\frac{2}{3}$ by $3\frac{5}{9}$
7. $4\frac{4}{5}$ by $6\frac{1}{3}$
8. $14\frac{1}{2}$ by $5\frac{4}{5}$
9. $27\frac{2}{3}$ by $8\frac{3}{10}$
10. $43\frac{1}{2}$ by $10\frac{1}{2}$
11. $19\frac{4}{5}$ by $1\frac{4}{7}$
12. $29\frac{37}{40}$ by $21\frac{3}{8}$

Problem 12 may be expressed in this way $\dfrac{29\frac{37}{40}}{21\frac{3}{8}}$, but it is solved in the same way.

Solve:

13. $\dfrac{2\frac{2}{3}}{1\frac{3}{4}}$
14. $\dfrac{5\frac{1}{3}}{2\frac{1}{2}}$
15. $\dfrac{10\frac{2}{3}}{3\frac{1}{8}}$
16. $\dfrac{2 \times 2\frac{1}{3}}{6\frac{2}{9}}$
17. $\dfrac{3\frac{1}{4} - \frac{2}{3}}{3\frac{2}{3}}$
18. $\dfrac{6\frac{1}{2} - \frac{3}{4}}{2\frac{1}{2}}$
19. $\dfrac{3 \times 2\frac{3}{8}}{2\frac{1}{4}}$
20. $\dfrac{3\frac{1}{2} \times 6\frac{1}{4}}{1\frac{3}{4}}$
21. $\dfrac{3\frac{1}{4} \times 2\frac{1}{3}}{1\frac{1}{12}}$
22. $\dfrac{4 \times 3\frac{3}{4}}{5 - \frac{2}{5}}$
23. $\dfrac{6\frac{1}{4} - 2\frac{2}{3}}{5\frac{1}{2}}$
24. $\dfrac{80 \times 4\frac{1}{2}}{8\frac{1}{4}}$
25. $\dfrac{8\frac{1}{6} \times 2\frac{1}{2}}{4\frac{1}{2}}$
26. $\dfrac{23 - 3\frac{3}{7}}{2 \times 1\frac{1}{7}}$
27. $\dfrac{5\frac{1}{2} \times 3\frac{1}{4}}{3\frac{1}{10} - 1\frac{4}{5}}$
28. $\dfrac{5\frac{3}{8} - 2\frac{1}{4}}{3\frac{1}{4} \times 2\frac{1}{2}}$
29. $\dfrac{3\frac{3}{5} \times 2\frac{2}{3}}{5\frac{1}{2} - 2\frac{1}{6}}$
30. $\dfrac{3\frac{4}{15} - 2\frac{5}{6}}{3\frac{1}{4} \times 2}$

31. Mr. Ames sold $630\frac{7}{8}$ pounds of wool at $32\frac{1}{2}$¢ per pound. How much did he receive for it?

32. A farmer cut $3\frac{2}{3}$ tons of hay per acre from $13\frac{1}{2}$ acres. Find the value of the hay at \$$12\frac{3}{4}$ per ton.

33. Mr. Anderson sold $\frac{2}{3}$ of $66\frac{1}{2}$ acres of land at \$$47\frac{1}{2}$ per acre. For how much did he sell the land?

34. How many badges $6\frac{2}{3}$ inches long can be cut from $23\frac{1}{3}$ yards of ribbon?

35. $\frac{2}{3}$ of $\frac{4}{9}$ of Mr. Adams's farm was 32 acres. If he sold the farm at $105 per acre, how much did he get from the sale?

36. How many ribbons $\frac{2}{3}$ of a yard long can be cut from $46\frac{2}{3}$ yards of ribbon?

37. Two boys buy a sled. One pays for $\frac{2}{3}$ of the cost and the other $\frac{1}{3}$ of the cost. If the boy that paid $\frac{2}{3}$ of the cost paid 90¢, how much did the sled cost?

38. If any two factors in a division are given, how may we obtain the third factor? Make problems to illustrate.

39. The dividend is $163\frac{3}{4}$, the quotient is $218\frac{1}{3}$. Find the divisor.

40. $\frac{11}{12}$ is the product of 6 and what other number?

41. $\frac{4}{5}$ of the length of a flag pole is 60 feet. What is the length of $\frac{2}{3}$ of the pole?

42. $\frac{2}{3}$ of $\frac{3}{4}$ of the time I worked for Mr. Ward is 12 days. Find my pay for the whole time at $2.50 per day.

43. The length of a certain city square is $338\frac{1}{4}$ feet. Find its length in rods.

44. An automobile ran $63\frac{4}{15}$ miles in $2\frac{1}{2}$ hours. Find the average rate per hour.

45. James weighs $160\frac{3}{4}$ lb., Sara $108\frac{1}{16}$ lb., John $135\frac{3}{4}$ lb., Mary $121\frac{5}{8}$ lb., and Henry $124\frac{5}{6}$ lb. Find $\frac{2}{3}$ of their combined weight.

46. Paul averages $2\frac{1}{2}$ feet at a step. How many steps does he take in going 1 mile?

47. The lead lining in a tank weighs $3\frac{3}{8}$ pounds to the square foot. How many pounds will be necessary to line a tank containing $275\frac{1}{2}$ square feet of inside surface?

COMPARISON — WHOLE NUMBERS AND FRACTIONS

1. $\frac{1}{2}=\frac{?}{8}$; $\frac{2}{4}=\frac{?}{8}$. Then how do $\frac{1}{2}$ and $\frac{2}{4}$ compare?

2. If a unit is first divided into halves and then each half into halves, into how many parts is the unit divided? Is $\frac{1}{4}$ of a unit larger or smaller than $\frac{1}{2}$ of a unit?

3. Divide a unit into halves, fourths, eighths, and sixteenths, and show how many sixteenths of a unit it takes to make $\frac{1}{4}$ of the unit; $\frac{1}{8}$ of the unit; $\frac{3}{4}$ of the unit; $\frac{1}{2}$ of the unit.

4. Draw equal squares to show that $\frac{1}{2}=\frac{4}{8}$ or $\frac{8}{16}$.

5. Compare $\frac{8}{2}$ and $\frac{4}{2}$; $\frac{4}{5}$ and $\frac{12}{5}$; $\frac{8}{3}$ and $\frac{2}{3}$.

6. How does $\frac{4}{5}$ of 20 compare with $\frac{1}{2}$ of 20? $\frac{7}{8}$ of 16 with $\frac{3}{4}$ of 16? $\frac{3}{5}$ of 50 with $\frac{1}{4}$ of 20?

7. A has 40 acres of land, and B 60 acres. How does A's farm compare in size with B's?

8. 8 is what part of 12, 16, 24, 32, 48, 72?

Suggestion. — Make 8 the numerator in each case and the other numbers the denominators and reduce the fractions to their lowest terms. Thus, $\frac{8}{12}=\frac{2}{3}$; $\frac{8}{16}=\frac{1}{2}$; $\frac{8}{24}=\frac{1}{3}$, etc.

9. If 5 quarts of milk cost 45 cents, how much will 10 quarts cost? 15 quarts? 20 quarts?

10. Elizabeth buys $3\frac{1}{2}$ yards of ribbon for 35 cents. At the same rate, how much would she pay for $10\frac{1}{2}$ yards?

Suggestion. — How many times $3\frac{1}{2}$ is $10\frac{1}{2}$?

11. A woodsman cuts 15 cords of wood in 6 days. How many cords, at the same rate, could he cut in 48 days?

12. Compare 8 and 2; 6 and 4; 2 and 8; 5 and 10.

13. Compare $\frac{1}{2}$ and $\frac{1}{4}$; $\frac{1}{4}$ and $\frac{1}{2}$; $\frac{1}{6}$ and $\frac{1}{12}$.

14. Compare 24 with 4, 6, 8, 48, 72, 16, 20.

15. Draw a square inch and show that $\frac{1}{4}$ of it $= \frac{4}{16}$ of it; that $\frac{1}{2}$ of it $= \frac{8}{16}$ of it.

16. If $\frac{1}{4}$ of a man's weekly wages is $2.75, how much is $\frac{1}{2}$ of his weekly wages?

SUGGESTION. — $\frac{1}{2}$ is how many times $\frac{1}{4}$?

17. $3\frac{1}{2}$ pounds of rice cost 35 cents. At that rate how much will 7 pounds cost?

18. If $\frac{1}{2}$ of my money is $10, and George has 6 times my money, how much has George?

19. In New York $9\frac{1}{4}$ inches of rain fell in 3 months. At that rate how much will fall in a year?

20. If a man pays $3675 for 60 acres of land, at the same rate how much should he pay for 120 acres?

21. My telephone bill is $12.85 a month. At that rate how much should I pay in $2\frac{3}{4}$ years?

22. My coal bill for $5\frac{1}{2}$ tons is $11. What is the bill of my neighbor who buys $27\frac{1}{2}$ tons at the same rate?

23. If 30 bushels of oats sell for $13.20, how much will 60 bushels sell for?

24. If a boy receives $7.50 for two weeks' work, how much should he receive for 12 weeks' work?

25. How much will a clerk earn in a year if he earns $180 in 3 months?

26. If 4 tons of coal cost $$8\frac{4}{5}$, how much will 16 tons cost?

27. When 5 books cost $17.50, how much will 25 such books cost?

28. A man walked $11\frac{1}{4}$ miles in 3 hours. At the same rate, how far would he walk in 6 hours?

REVIEW OF FRACTIONS

1. A boy earns $\$2\frac{3}{4}$ a week and spends $\$1\frac{4}{5}$. If he puts the remainder in bank, what will his bank account be in 19 weeks?

2. May went to the store with $20. If she spends $\$2\frac{1}{2}$ for a pair of shoes and $\$4\frac{3}{4}$ for a hat, how much change will she receive?

3. From a web of muslin containing 60 yards, $19\frac{3}{4}$ yd. were sold to one customer, $13\frac{1}{2}$ yd. to another, and $9\frac{1}{4}$ yd. to another. How many yards remained?

4. A dealer sold 2 loads of coal at $7.20 a ton. If the first load contained $2\frac{3}{8}$ T., and the second $3\frac{1}{4}$ T., how much did he receive?

5. How many yards of muslin can be bought for 75¢, if 3 yards cost 25¢?

6. If John weighs $96\frac{3}{4}$ lb. and Mary weighs $36\frac{1}{2}$ lb. less than John, how much do they both weigh?

7. A farmer bought 480 acres of land. He sold $148\frac{1}{4}$ acres to one man, and $125\frac{1}{2}$ acres to another. What was the remainder worth at $20 an acre?

8. How many days will it take a man to earn $\$126\frac{1}{2}$, if he earns $\$2\frac{3}{4}$ a day?

9. A man dies leaving $4440. He leaves $\frac{1}{12}$ of it to his son, $\frac{1}{3}$ of it to his daughter, $\frac{3}{8}$ of it to his widow, and the rest to a hospital. How much does each receive?

10. John bought 3 pieces of cloth containing $19\frac{1}{2}$ yd., $26\frac{1}{4}$ yd., and $35\frac{3}{8}$ yd. respectively. How many yards did he buy?

11. A man worked $43\frac{3}{4}$ hr. one week, and $56\frac{5}{12}$ hr. the next. How many hours did he work in the two weeks?

12. A man paid $\frac{1}{2}$ of his indebtedness one year, $\frac{1}{2}$ of the remainder the second year, and $\frac{1}{2}$ of what then remained the third year. Then he owed $516. How much did he owe at first?

13. From a certain number $2\frac{2}{5} + 3\frac{1}{3}$ was subtracted, leaving a remainder of $10\frac{4}{15}$. What was the number?

14. One fifth of a certain number, minus $2\frac{3}{8}$, equals $87\frac{5}{8}$. What is the number?

15. Mrs. Smith bought 4 pieces of lace containing $4\frac{3}{8}$ yd., $6\frac{3}{4}$ yd., $5\frac{1}{2}$ yd., and $9\frac{7}{8}$ yd., respectively. How much were they worth at $12\frac{1}{2}$¢ a yard?

16. If an acre of land is worth $32, how much is $\frac{3}{4}$ of an acre worth?

17. A man paid $45 for $\frac{5}{6}$ of a quantity of grain. Find the value of the entire quantity at the same rate.

18. How many poor families can be supplied with $\frac{1}{8}$ of a ton of coal each from $9\frac{7}{8}$ tons?

19. Find the cost of $36\frac{1}{4}$ pounds of tea at 32¢ a pound.

20. If $\frac{3}{4}$ of a yard of silk cost 45 cents, what is the value of $6\frac{1}{2}$ yards at the same rate?

21. What number taken from the sum of $16\frac{1}{2}$ and $28\frac{2}{3}$ will leave $19\frac{1}{4}$?

22. What is the cost of $\frac{3}{4}$ of a yard of muslin at 12¢ a half yard?

23. The sum of two numbers is $126\frac{2}{3}$, and the larger number is $94\frac{3}{4}$. What is the smaller number?

24. A man spends $\$6\frac{1}{2}$ for board, $\$12\frac{1}{4}$ for clothing, $\$5\frac{1}{5}$ for books, and has $12 left. How many dollars and cents had he at first?

25. If 75¢ is the cost of $\frac{3}{4}$ of a yard of cloth, what is the cost of 5 yards?

26. \$1.50 is the value of $\frac{5}{8}$ of a yard of broadcloth. How many yards can be bought for \$20?

27. $\frac{3}{4}$ of a number is 9. What is the number?

28. In traveling 72 miles a man went $\frac{2}{3}$ of the distance the first day, $\frac{1}{8}$ of the distance the second day, and the remainder the third day. How far did he travel the third day?

29. From a farm of $225\frac{3}{4}$ acres there were sold $150\frac{1}{2}$ acres. How many acres were left?

30. How much must be paid for 16 tables at $\$7\frac{3}{4}$ each?

31. At $\$\frac{3}{4}$ each, how many books can I buy for \$36?

32. A man bought a hat for $\$5\frac{3}{4}$, a pair of shoes for $\$6\frac{1}{2}$, a pair of gloves for $\$3\frac{1}{2}$, and a suit for $\$22\frac{1}{4}$. How much did he pay for all?

33. A clerk earns \$75 a month and spends $\$36\frac{3}{4}$. How much has he left?

34. At $\$.87\frac{1}{2}$ a bushel, what is the cost of 56 bushels of grain?

35. How many chairs, at $\$5\frac{1}{4}$ each, can be bought for $\$262\frac{1}{2}$?

36. A lady bought $\frac{3}{4}$ of a yard of narrow lace, $1\frac{5}{8}$ yards of medium width lace, and $2\frac{1}{2}$ yards of wide lace. How many yards did she buy in all?

37. From a piece of muslin containing 40 yards there were sold $25\frac{7}{8}$ yards. How many yards remained?

38. At $\$.12\frac{1}{2}$ a yard, what is the cost of 42 yd. of muslin?

39. How many pencils, at $\frac{1}{2}$¢ each, can be bought for \$1.16?

40. One coat requires $2\frac{3}{8}$ yards. How many coats can be made out of $35\frac{5}{8}$ yards?

41. John weighs $124\frac{1}{2}$ pounds, and Ned weighs $18\frac{3}{4}$ pounds less. How many pounds does Ned weigh?

42. A farmer sold $35\frac{3}{4}$ bushels at one time, and $21\frac{7}{8}$ bushels at another time. How many bushels did he sell?

43. A tailor uses $9\frac{3}{4}$ yards of cloth for a suit. How many yards will it take for 32 suits?

44. John and James cut $3\frac{3}{8}$ cords of wood in one day. In how many days can they cut $84\frac{3}{4}$ cords?

45. A man raised $236\frac{1}{2}$ bushels of oats, and sold $129\frac{3}{4}$ bushels. How many bushels had he left?

46. A man exchanged with a grocer $2\frac{1}{4}$ bushels of potatoes at 60¢ a bushel, for $6\frac{3}{4}$ pounds of bacon. How much did the grocer charge per pound for the bacon?

47. A merchant sold some grain for $63 which was $\frac{7}{9}$ of its cost. What was the cost of the grain?

48. $\frac{3}{8}$ of a building is valued at $300? What is the value of the whole building?

49. $1\frac{1}{2}$ lb. of butter cost 30¢. Find the cost of $2\frac{3}{4}$ lb.

50. A owns 160 sheep and B owns $\frac{1}{4}$ as many as A. C owns $\frac{1}{2}$ as many as B. How many sheep do all own?

51. Show that multiplying or dividing both terms of a fraction by the same number does not change its value.

52. How many potatoes are there in 12 barrels, if one barrel contains 2 bushels 3 pecks?

53. $48 - 12\frac{1}{2} = ?$ $12\frac{3}{4} \div 5\frac{2}{5} = ?$ $10\frac{5}{8} \div 1\frac{2}{3} = ?$

54. For 5 cents one can buy 3 oranges. How much must be paid for 12 oranges?

DECIMALS

Decimal parts of the dollar.

1. How many dimes equal a dollar? Then what part of a dollar is a dime?

2. How many cents equal a dollar? Then what part of a dollar is a cent?

3. Ten mills equal one cent. How many mills equal a dollar? Then what part of a dollar is a mill?

Mills are not coined, but are used for exactness in computations.

When we think of a dollar as dimes, it has 10 equal parts; when we think of a dollar as cents, it has 100 equal parts; when we think of a dollar as mills, it has 1000 equal parts. A mill is $\frac{1}{10}$ of a cent; a cent $\frac{1}{10}$ of a dime; and a dime $\frac{1}{10}$ of a dollar.

This division of the dollar into tenths, hundredths, thousandths, etc., we call **decimal parts of the dollar**.

The **decimal point** is the point separating dollars and cents. Thus, in $2.75 the point separates 2 dollars from 75 cents.

4. What decimal part of a dollar are 5 dimes? 6 dimes? 8 dimes? 9 dimes?

5. What decimal part of a dollar are 5 cents? 8 cents? 9 cents? 10 cents?

The first place to the right of the decimal point is occupied by *dimes* or *tenths* of a dollar; the second place, by *cents* or *hundredths* of a dollar; the third place, by *mills* or *thousandths* of a dollar.

Thus, 8 dimes, 5 cents = 85 cents. Cents occupy the first two places to the right of the decimal point. Observe that dimes, cents, and mills can always be written as decimal parts of a dollar; thus, 8 dimes = $.80; 2 mills = $.002.

6. In $1.256, state what each figure represents.

7. Name the parts of a dollar, first as tenths, hundredths, and thousandths; then as cents and mills: $.65, $8.05, $2.005, $.50, $.75, $.80, $.705.

8. Write in figures: six dollars, five cents; ten dollars, fifty cents; three mills; five cents; five mills.

We may also find tenths, hundredths, thousandths, etc., of any unit.

READING AND WRITING DECIMALS

One tenth may be written .1 as well as $\frac{1}{10}$; **one hundredth** may be written .01 as well as $\frac{1}{100}$; and **one thousandth** may be written .001 as well as $\frac{1}{1000}$.

1. Read: .8 ft., .5 lb., .7 pk., .5 ft., .7 mi.

A **decimal point** is a period placed before tenths.

A **decimal fraction** is any number of 10ths, 100ths, 1000ths, etc., of a unit. When expressed after a decimal point and without a written denominator it is usually called a **decimal**.

The first place to the right of the decimal point is called **tenths,** the second place **hundredths,** and the third place **thousandths.**

2. In 55.55, the 5 hundredths is what part of the 5 tenths? the 5 tenths is what part of the 5 units? the 5 units is what part of the 5 tens?

In any number, whether a whole number or a decimal, *the value of a figure in any place is* $\frac{1}{10}$ *of the value of the same figure standing one place to the left.*

3. What is the largest decimal division of a unit? the second largest? the third largest?

4. $.06 = \frac{?}{100} = \frac{?}{1000}$

5. $.25 = \frac{?}{100} = \frac{?}{1000}$

6. $.05 = \frac{?}{100} = \frac{?}{1000}$

7. $.9 = \frac{?}{10} = \frac{?}{100} = \frac{?}{1000}$

8. $.025 = \frac{?}{1000} = \frac{?}{10000}$

9. $.349 = \frac{?}{1000} = \frac{?}{10000}$

Observe that a decimal is always less than a unit.

Hundreds	Tens	Ones	Dec. Point	Tenths	Hundredths	Thousandths
5	2	5	.	2	5	6

This number is read, five hundred twenty-five *and* two hundred fifty-six thousandths.

10. What do we call the decimal point when we read a number? What word, then, always joins the whole number and the decimal?

Observe that we express every number as units, or ones, and parts of a unit. Thus: 525.256 is 525 units and .256 of a unit.

As the first decimal division of a unit is tenths, we always begin to enumerate the decimal at tenths' place; thus:

tenths	hundredths	thousandths
.0	0	5

11. At what place do we begin to enumerate whole numbers?

12. Read the following: .25, .025, 25.005, 7.05, 321.1, 0.875, 1.008, 100.001, 0.001.

13. Write as decimals: $\frac{5}{10}$, $\frac{7}{100}$, $\frac{25}{1000}$, $\frac{1}{10}$, $\frac{15}{1000}$, $\frac{2}{1000}$, $26\frac{6}{1000}$, $100\frac{1}{1000}$, $1\frac{8}{100}$, $70\frac{105}{1000}$.

Write decimally:

14. Two thousandths.

15. Two and two thousandths.

16. Five hundredths.

17. Two hundred and two thousandths.

18. Two hundred two thousandths.

19. Three and five tenths.

20. Seventy-five hundredths.

21. Five hundred and five thousandths.

22. Thirty-three thousandths.

23. Ninety-five thousandths.

24. Two hundred and five hundredths.

25. Six and nine tenths.

26. Six hundred and six hundredths.

COMPARISON OF COMMON FRACTIONS AND DECIMALS

1. $\frac{5}{10} = \frac{50}{100} = \frac{500}{1000}$; $.5 = .50 = .500$.

2. Do naughts at the right of a decimal affect its value? *Annexing naughts to the right of a decimal does not affect its value.*

3. What is a fractional unit?

4. What is the largest fractional unit that may be expressed decimally? the second largest? the third largest?

5. Change $\frac{50}{100}$ to tenths.

6. Express .25, .45, .75, .025, each in the form of a common fraction.

7. Change .5 to equivalent decimals expressed in hundredths and thousandths. Thus, $.5 = .50 = .500$.

8. Name the three largest fractional units in their order; the three largest decimal fractional units.

9. Change $\frac{125}{1000}$ to an equivalent decimal.

Changing a decimal to a common fraction.

1. Change .75 to a common fraction in its lowest terms.

$.75 = \frac{75}{100} = \frac{3}{4}$

Expressed in the form of a common fraction $.75 = \frac{75}{100}$. By dividing both numerator and denominator of $\frac{75}{100}$ by 25, we reduce it to its lowest terms, $\frac{3}{4}$.

To change a decimal to a common fraction, write the decimal, omitting the decimal point, place the decimal denominator beneath it, and change the fraction to its lowest terms.

Change to fractions:

2. .15
3. .825
4. .9
5. .325
6. .75
7. .025
8. .125
9. .425

10. Memorize the following equivalents:

$\frac{1}{2} = .5$ or $.50$
$\frac{1}{4} = .25$
$\frac{3}{4} = .75$
$\frac{1}{5} = .2$ or $.20$
$\frac{2}{5} = .4$ or $.40$
$\frac{3}{5} = .6$ or $.60$
$\frac{4}{5} = .8$ or $.80$
$\frac{1}{8} = .125$
$\frac{3}{8} = .375$

11. Change to *tenths:* $\frac{1}{5}$; $\frac{1}{2}$; $\frac{2}{5}$; $\frac{3}{5}$; $\frac{4}{5}$.

12. Express as decimal hundredths: $\frac{1}{4}$; $\frac{3}{4}$; $\frac{1}{8}$; $\frac{3}{8}$.

Change to fractions and reduce to lowest terms:

13. .45
14. .625
15. .75
16. .65
17. .375
18. .80
19. .20
20. .60
21. .125
22. .90
23. .96
24. .72
25. .40
26. .48
27. .150
28. .50
29. .025
30. .08
31. .075
32. .025
33. .12
34. .225
35. .700
36. .800

ADDITION OF DECIMALS

1. What kind of fractions can be added or subtracted?

In *adding* or *subtracting* decimals, like units must always be written under one another; thus, $.8 + .85 + .096$ may be written thus:

$$\begin{array}{lrlr} & .8 & & .8 + .8 = 1.6 \\ \text{Added} & .85 & \textbf{Test:} & .05 + .09 = .14 \\ & .096 & & .006 = .006 \\ \hline & 1.746 & & 1.746 \end{array}$$

2. In how many of the decimals are there tenths to be added? hundredths? thousandths?

3. Why must tenths be written *under* tenths, hundredths *under* hundredths, etc.?

A **mixed** decimal is a whole number and a decimal united; thus, $4 + .05$, or 4.05, is a mixed decimal.

Written Work

1. Add $45.5 + 6.005 + 40.$

$$\begin{array}{r} 45.5 \\ 6.005 \\ 40. \\ \hline 91.505 \end{array}$$

Keep the decimal points and units of the same order in a column, and add as in whole numbers, placing the decimal point in the sum under the points above.

Find the sums of the following:

2. $.1 + .2 + .35 + .365 = ?$

3. $.02 + .05 + .095 + .056 = ?$

4. $.05 + .007 + .089 + .11 = ?$

5. $1.2 + 3.4 + 4.5 = ?$

6. $3.04 + 4.05 + 6.099 = ?$

7. $.005 + .007 + .009 + .0101 = ?$

8. $2.006 + 7.009 + 9.012 = ?$

9. $.001 + .001 + .0902 = ?$

10. $10 + 2.1 + 14.9 + 17.85 = ?$

11. $.9 + .85 + .005 + .25 + .895 = ?$

Add:

12.	**13.**	**14.**	**15.**
1.45	.424	.7	11.111
3.7	8.2	.425	3.06
10.01	6.16	18.54	.635
2.005	19.009	7.011	.000

16.	**17.**	**18.**	**19.**
18.002	.040	89.400	.707
2.056	48.010	75.800	101.101
121.114	.708	761.612	96.086
2.02	89.010	1245.000	27.409

20. Find the sum of 15.38, 9.17, 3.07, and 20.35.

21. A boy picked on Monday, .75 of a bushel of berries; on Tuesday, .875 of a bushel; on Wednesday, 1.125 of a bushel. How many bushels did he pick in the three days?

22. Helen paid $.25 for a handkerchief, $2.75 for a pair of shoes, $.45 for lace, and $1.49 for a waist. How much did they all cost?

23. A train runs the first hour 19.625 miles; the second hour, 20.5 miles; the third hour, 20.75 miles; the fourth hour, 21.225 miles. How far does it run in the four hours?

24. Find the number of pounds in the following purchases: 1.25 lb. of cheese, 3.5 lb. of sugar, .5 lb. of cloves.

25. The distance from Harrington to Houston is 4.31 miles, thence to Ellendale 11.25 miles, thence to Georgetown 8.37 miles. How far is it from Harrington to Georgetown?

SUBTRACTION OF DECIMALS

Find differences:

1. $.5 - .3 = ?$	**5.** $.008 - .002 = ?$
2. $.9 - .8 = ?$	**6.** $.014 - .011 = ?$
3. $15.8 - 11.7 = ?$	**7.** $.08 + .09 - .12 + .04 + .02 = ?$
4. $4.7 - 3.2 = ?$	**8.** $.009 + .003 - .007 - .004 = ?$

Written Work

1. From 16.35 subtract 11.76.

$$\begin{array}{r} 16.35 \\ \underline{11.76} \\ 4.59 \end{array}$$

Keep the decimal points in a column and subtract as in whole numbers, placing the decimal point in the difference under the points above.

2. 7. 1.21	**3.** 16. 3.046	**4.** 1.101 .796	**5.** 265.36 84.468
6. 25.2 9.18	**7.** 151.003 78.076	**8.** 954.1 258.375	**9.** 36.291 17.456
10. 144.001 12.256	**11.** 300. 261.385	**12.** 86.59 53.594	**13.** 728.3 619.333

14. Warren had $7.50 and spent $3.75. How much had he remaining?

15. The distance between two towns is 9 miles. After I have walked 3.625 miles, how far have I yet to walk?

16. A man having 120 acres of land, sold to one man 28.75 acres, and to another, 35.5 acres. How many acres had he left?

17. If I pay $1.25 for car fare, $.65 for dinner, and $.90 for an umbrella, how much change have I left from a five-dollar bill?

18. The second floor of a house is 18.78 feet above the floor of the cellar, and the first floor is 7.92 feet above it. How far is it from the first floor to the second?

19. Four lots measure in width 123.08 ft. Three of them are respectively 25 ft., 32.72 ft., and 36.9 ft. wide. What is the width of the fourth?

20. A boy having $4.25 spent for skates $1.25, for a cap $.50, and for a hockey stick $.45. How much had he left?

21. A lady having 25.75 pounds of butter sold to one customer 3.25 pounds, to another 8.5 pounds, to another 7.25 pounds, and the balance to a fourth customer. How many pounds did the fourth customer buy?

22. From a ham weighing 18.125 lb. a butcher sold 3.25 lb., 4.50 lb., 2.75 lb., and 2.5 lb. How many pounds had he left?

23. A fisherman brought home four trout weighing respectively 1.25 pounds, .875 pounds, 1.375 pounds, and 1.125 pounds. How much less than 5 pounds did they all weigh?

24. A farmer cut 40 tons of hay in 1905. He sold 6.85 tons to one man, and 5.55 tons to another. He fed the rest to his stock. How many tons did he feed to his stock?

25. A lady bought 4.75 yards of woolen cloth, 11.625 yards of cotton cloth, and 6.875 yards of silk. How many yards less than 30 yards did she buy?

26. A man having $20 spent $4.75 for board, $2.80 for a room, $.88 for laundry, $1.75 for a pair of gloves, and $3.50 for a pair of shoes. How much had he left?

27. A merchant purchased the following: coffee $15.25, sugar $18.35, cakes $11.65, fruit $27.75, canned corn $8.45, canned peaches $12.30, and vegetables $21.90. How much less than $120 was the amount of his bill?

MULTIPLICATION OF DECIMALS

Multiplying a decimal by an integer.

1. $5 \times .3$ means that .3 is taken as an addend 5 times. Thus, $.3 + .3 + .3 + .3 + .3 = 15$ tenths or 1.5.

By multiplication $5 \times .3 = 1.5$.

2. $5 \times .03$ means that .03 is taken as an addend 5 times. Thus, $.03 + .03 + .03 + .03 + .03 = 15$ hundredths or .15.

By multiplication $5 \times .03 = .15$.

3. 5×1.007 means that 1.007 is taken as an addend 5 times. Thus, $1.007 + 1.007 + 1.007 + 1.007 + 1.007 = 5.035$.

By multiplication $5 \times 1.007 = 5.035$.

4. In each problem above, how many decimal places are there in the multiplicand? how many in the product?

Observe that in multiplying a decimal by an integer, the product contains the same number of decimal places as the multiplicand.

Written Work

1. Multiply 5.75 by 6.

$$\begin{array}{r} 5.75 \\ 6 \\ \hline 34.50 \end{array}$$

6×5 hundredths $= 30$ hundredths, or 3 tenths and no hundredths. Write naught in hundredths' place and carry the 3 tenths. 6×7 tenths $= 42$ tenths; 42 tenths + 3 tenths = 45 tenths, or 4 units and 5 tenths. Write 5 in tenths' place and carry the 4 units. Place the decimal point. 6×5 units $= 30$ units; 30 units + 4 units = 34 units.

Find products:

2. $8 \times .015$

3. $9 \times .005$

4. $8 \times .17$

5. $11 \times .207$

6. $7 \times .97$

7. $12 \times .025$

8. $6 \times .604$

9. $9 \times .054$

10. $86 \times .861$

11. $74 \times .037$

12. $67 \times .92$

13. $44 \times .705$

14. $55 \times .066$

15. $39 \times .467$

16. $48 \times .095$

17. $36 \times .081$

18. How much will 7 arithmetics cost at $.82 apiece?

19. At $.35 apiece, how much will 24 chickens cost?

20. A rod is 16.5 feet. How many feet are there in 9 rods?

21. When a man earns $3.65 per day, how much does he earn in 26 days?

22. A pound of cream cheese costs $.115. How much do 126 pounds cost?

23. If an automobile averages 17.75 miles an hour, how far will it travel in 14 hours?

Multiplying a decimal by a decimal.

1. Multiply 1.5 by 4. When a decimal is multiplied by an integer, what do you observe about the number of decimal places in the product?

2. Multiply .1 by .01; $\frac{1}{10} \times \frac{1}{100} = \frac{1}{1000} = .001$. Multiply 1.5 by .5; $1.5 = \frac{15}{10}$; $\frac{15}{10} \times \frac{5}{10} = \frac{75}{100} = .75$. When a decimal is multiplied by a decimal, what do you observe about the number of decimal places in the product?

Written Work

1. Multiply .75 by .3.

Since there are two decimal places in the multiplicand and 1 in the multiplier, point off 3 decimal places in the product, making the answer .225.

$$\begin{array}{r} .75 \\ .3 \\ \hline .225 \end{array}$$

Test: $.75 = \frac{75}{100}$, and $.3 = \frac{3}{10}$. $\frac{75}{100} \times \frac{3}{10} = \frac{225}{1000}$ or .225, a decimal.

Multiply as in integers, pointing off as many decimal places in the product as there are decimal places in both factors.

Find products:

2. .8 × .27
3. .5 × .45
4. .15 × .256
5. 6.5 × 10
6. 5.7 × 9.4
7. 3.21 × 4.5
8. 7.24 × 8
9. .011 × 42
10. .57 × .15
11. 2.03 × .4
12. .145 × 48
13. 11.4 × 150
14. .025 × 124
15. 22.5 × 4.04
16. .75 × .624
17. 1.44 × 5.5
18. 2.4 × 64
19. 1.33 × 44

20. Find the cost of 11.5 yards of cloth at $12\frac{1}{2}$ cents a yard.

21. Mrs. Crane bought 3.5 pounds of steak at $.16 per pound, 6 pounds of sugar at $.05 per pound, 4 pounds of coffee at $.28 per pound, and 3 quarts of cranberries at $.10 per quart. She gave in payment 3 one-dollar bills. How much change should she receive?

22. How much will 41.25 yards of linoleum cost at $1.25 per yard?

23. A train between Los Angeles and San Francisco runs 13.5 hours at the rate of 35.7 miles per hour? What is the distance between the two cities?

24. A mail carrier averages 3.25 miles per hour while delivering mail. If he spends 5.25 hours delivering each day how far does he walk per day?

25. Find the cost of 5.125 yards of silk at $1.75 a yard. At the same price per yard find the cost of 8.875 yards.

26. At $2.50 per day, how much will 4 men earn in 6.5 days?

27. A cubic foot of water weighs 62.5 pounds. How much do 12.75 cubic feet of water weigh?

DIVISION OF DECIMALS

Dividing a decimal by an integer.

Written Work

1. Divide .84 by 4 in this way: $\begin{array}{r}4\overline{).84}\\ .21\end{array}$

Divide and test, placing a decimal point in the quotient before beginning to divide:

2. $6\overline{).66}$
3. $3\overline{).96}$
4. $8\overline{).808}$
5. $7\overline{).714}$
6. $5\overline{).535}$
7. $4\overline{).848}$
8. $7\overline{).847}$
9. $6\overline{).936}$
10. $8\overline{).896}$

11. Explain why adding *naughts* to the right of a decimal does not change its value; thus, .8 = .80, .05 = .050.

It is sometimes necessary to add naughts to the right of the dividend to complete the division.

12. Divide .12 by 5. $5\overline{).12} = \begin{array}{r}5\overline{).120}\\ .024\end{array}$

Find the quotients and test:

13. $4\overline{).3}$
14. $8\overline{).6}$
15. $6\overline{).27}$
16. $5\overline{).28}$

17. .6 ÷ 2
18. .9 ÷ 3
19. .12 ÷ 6
20. .005 ÷ 5
21. .008 ÷ 4
22. .27 ÷ 9
23. .2 ÷ 4
24. .24 ÷ 8
25. .024 ÷ 6
26. .102 ÷ 3
27. .039 ÷ 13
28. .144 ÷ 12
29. .015 ÷ 3
30. .063 ÷ 7
31. .904 ÷ 8
32. .72 ÷ 10
33. .108 ÷ 3
34. .08 ÷ 2
35. .125 ÷ 5
36. .16 ÷ 4
37. .35 ÷ 7
38. .077 ÷ 11
39. .022 ÷ 2
40. .036 ÷ 6

Dividing a mixed decimal by an integer.

Written Work

Divide in this way:

1. $6\overline{)6.648}$
 1.108

2. $8\overline{)24.600}$
 3.075

3. $9\overline{)729.83}$
 $81.09\frac{2}{9}$

Observe that in dividing a decimal or a mixed decimal by an integer, the dividend is simply separated or *partitioned* into equal parts.

4. Divide 39.25 by 25.

5. Divide 12.648 by 24.

$$\begin{array}{r} 1.57 \\ 25\overline{)39.25} \\ \underline{25} \\ 14.2 \\ \underline{12.5} \\ 1.75 \\ \underline{1.75} \end{array} \qquad \begin{array}{r} .527 \\ 24\overline{)12.648} \\ \underline{12.0} \\ 64 \\ \underline{48} \\ 168 \\ \underline{168} \end{array}$$

How many times is 25 contained in 39? in 14.2? in 1.75?

In practice, we simply divide as in the division of integers. Since 24 is larger than 12.648, the quotient must be a decimal.

Place a decimal point directly above or below the decimal point in the dividend, before beginning to divide; then divide as in the division of integers.

Divide and test:

6. 69.92 ÷ 23
7. 29.54 ÷ 14
8. 195.2 ÷ 32
9. 401.4 ÷ 18
10. 3.434 ÷ 34
11. 156.4 ÷ 46
12. 1.014 ÷ 26
13. 5.084 ÷ 41
14. .945 ÷ 35
15. 60.32 ÷ 52
16. .968 ÷ 44
17. .828 ÷ 23
18. 5.18 ÷ 37
19. .0833 ÷ 49
20. 1.566 ÷ 54
21. 2.546 ÷ 67
22. 8.437 ÷ 59
23. 233.32 ÷ 38
24. 283.88 ÷ 47
25. 6.497 ÷ 73
26. 16.150 ÷ 34
27. 55.660 ÷ 92
28. 5.460 ÷ 84
29. 1.6272 ÷ 18

30. Divide 12 by 16.

$12 \div 16 = 12.00 \div 16.$

$$\begin{array}{r} .75 \\ 16\overline{)12.00} \\ \underline{112} \\ 80 \\ \underline{80} \end{array}$$

12 is equal to 12.00, which divided by 16 equals .75.

A decimal point must be placed after an integer before naughts are annexed.

Divide:

31. $20 \div 75$

32. $60 \div 150$

33. $24 \div 228$

34. $30 \div 375$

35. $44 \div 99$

36. $110 \div 220$

37. $340 \div 1700$

38. $510 \div 1020$

39. 605 by 1210

40. 513 by 2052

41. 208 by 1664

42. 111 by 8888

Dividing any number by a decimal.

1. In .5, .25, .025 move the decimal point one place to the right and read the result; two places to the right; three places to the right.

2. In what short way, then, may a decimal be multiplied by 10? by 100? by 1000?

3. Multiply each of the following numbers first by 10 and read the results. Then by 100. Then by 1000:

.2, 2.5, .25, .04, .025, .002, .020, .001, 40.25, 4.05, 200, 21.0, .012, 1.001, 10.1, 400.1, 04.04, 50.0, 4.004.

Explain why:

4. $.2\overline{).24} = 2\overline{)2.4}$; $.04\overline{).0164} = 4\overline{)1.64}$; $1.6\overline{)25.6} = 16\overline{)256}$

5. $.6\overline{)18} = 6\overline{)180}$; $.12\overline{).144} = 12\overline{)14.4}$; $.08\overline{).48} = 8\overline{)48}$

6. $.09\overline{)8.1} = 9\overline{)810}$; $.25\overline{)2.25} = 25\overline{)225}$; $.05\overline{)5} = 5\overline{)500}$

7. Observe that when both the dividend and the divisor of $\frac{.8}{.2}$ are multiplied by 10, thus, $\frac{.8 \times 10}{.2 \times 10} = \frac{8}{2}$, the quotient remains the same.

8. Tell the number of places the decimal point must be moved to the right in both dividend and divisor in each of the following problems, in order to make the divisor an integer, then give quotients:

9. .5)$\underline{.25}$ .2)$\underline{2.6}$ .4)$\underline{4.4}$ .6)$\underline{66}$ .8)$\underline{8.08}$

10. .03)$\underline{.15}$ .12)$\underline{.96}$ .07)$\underline{.21}$ .09)$\underline{.81}$ .05)$\underline{.05}$

Written Work

1. Divide .025 by .05.

.05)$\underline{.025}$ = 5.)$\underline{2.5}$

0.5, *Ans.*

Make the divisor an integer by moving the decimal point two places to the right in both dividend and divisor. Then solve as in dividing a decimal by an integer.

A decimal is **divided by a decimal** *by moving the decimal point in both dividend and divisor the number of places to the right necessary to make the divisor a whole number, and dividing as in the division of a decimal by an integer.*

Divide:

2. .325 by .5
3. .756 by .9
4. 6.96 by .8
5. .444 by .6
6. .888 by .12
7. 1.445 by .17
8. 2.695 by .35
9. 3.528 by .42
10. 3.034 by .37
11. 2.538 by .27
12. .5655 by .65
13. .6150 by .82
14. 27.93 by .57
15. 52.51 by .59
16. 6.216 by .74
17. .6225 by .75
18. 8.930 by .94
19. 440.8 by .58
20. .0095 by .19
21. 20.25 by .45
22. 6.192 by .72
23. 3.360 by .35
24. 2.016 by .72
25. 826.5 by .95
26. 375.2 by .56
27. 7.728 by .84
28. 8.025 by .25

Find quotients:

29. .005 ÷ 5

30. .625 ÷ .05

31. 5.55 ÷ 5

32. 17.28 ÷ .12

33. 3.036 ÷ .06

34. 3.728 ÷ .016

35. .864 ÷ .24

36. 3.654 ÷ .21

37. 10.044 ÷ .36

38. 8.007 ÷ .03

39. 40.098 ÷ 1.23.

$$1.23\overline{)40.098} = 123.\overline{)4009.8}$$

40. 55.968 ÷ 1.32

41. 97.875 ÷ 2.61

42. 437.836 ÷ 5.32

43. 214.302 ÷ 3.82

44. 46.695 ÷ 1.65

45. 139.956 ÷ 3.21

46. 86.784 ÷ 2.26

REVIEW OF DECIMALS

1. At $8.25 per ton, how many tons can be bought for $41.25?

2. From five hundred eighty and sixty-seven ten-thousandths take ninety-six and forty-nine thousandths.

3. John has .75 of $2 and spends .3 of it. How much does he save?

4. If a car conductor earns $1.75 a day, how long will it take him to earn $638.75?

5. If 8.75 tons of coal cost $44.80, how many tons can be bought for $21.76?

6. If I paid $720 for land at $37.50 an acre, how many acres did I purchase?

7. How many tons are there in $27\frac{1}{20}$ tons, 15.7 tons, $9\frac{1}{8}$ tons, and 33.5 tons?

8. To the sum of 14.5 and 9.7 add their difference.

9. What is the value of 7.5 tons of hay at $18.75 per ton?

3. Show by equivalent decimals that naughts added to the right of a decimal do not affect its value.

4. Write as decimals, and as per cents:

$\frac{1}{2}$ $\frac{3}{4}$ $\frac{1}{20}$ $\frac{1}{25}$ $\frac{1}{10}$ $\frac{2}{5}$ $\frac{4}{5}$ $\frac{3}{8}$

5. What is the difference between .05 of \$100 and 5% of \$100?

6. $5\% = \frac{?}{20}$ of a number; $10\% = \frac{?}{10}$ of a number.

7. 25% of \$100 may be found in two ways: (*a*) $25\% = \frac{1}{4}$; $\frac{1}{4}$ of \$100 = \$25. (*b*) 25% = .25; .25 × \$100 = \$25.

Learn the following:

50 $\% = \frac{1}{2}$
$33\frac{1}{3}$ $\% = \frac{1}{3}$
25 $\% = \frac{1}{4}$
20 $\% = \frac{1}{5}$
$16\frac{2}{3}$ $\% = \frac{1}{6}$
$12\frac{1}{2}$ $\% = \frac{1}{8}$
10 $\% = \frac{1}{10}$
5 $\% = \frac{1}{20}$
75 $\% = \frac{3}{4}$
40 $\% = \frac{2}{5}$
80 $\% = \frac{4}{5}$
$37\frac{1}{2}$ $\% = \frac{3}{8}$

Give per cents at sight:

8. 20% of \$50
9. 25% of \$60
10. 10% of \$40
11. 50% of \$80
12. 40% of \$75
13. 5% of \$40
14. 6% of \$6
15. 75% of \$20
16. $12\frac{1}{2}\%$ of \$72
17. $33\frac{1}{3}\%$ of 30 days.
18. 50% of 60 minutes.
19. 75% of 100 books.
20. 40% of 20 rods.
21. 5% of 40 weeks.
22. $16\frac{2}{3}\%$ of 100 pounds.
23. 10% of 70 bushels.
24. 25% of 24 hours.
25. $12\frac{1}{2}\%$ of 800 bushels.

PERCENTAGE

In *Common Fractions* we learned that a number may be divided into *any number* of equal parts and any number of these may be taken.

Thus, $\frac{3}{4}$ of 60 means that 60 is divided into 4 equal parts and 3 of these parts are taken.

In *Decimal Fractions* we learned that a number may be divided into 10, 100, 1000, etc., equal parts, and that any number of these parts may be taken.

Thus, .9 of 60 means that 60 is divided into 10 equal parts and that 9 of these equal parts are taken.

We now come to a subject that divides a number into 100 equal parts only. We call this subject **Percentage.**

In common fractions we compute by *halves*, *thirds*, *fourths*, *sixths*, etc.; in decimal fractions we compute by *tenths*, *hundredths*, *thousandths*, etc.; but in percentage we compute by *hundredths* only.

Another name for *hundredths* is *per cent*, usually written "%."

We may now write any number of *hundredths* in three different ways, thus: $\frac{8}{100}$, .08, 8%, $\frac{25}{100}$, .25, 25%.

Percentage is simply an application of decimal fractions.

1. Write the following numbers as per cents:

.05 .03 .15 .20 .25 .40 .06 .75

2. Write the following as decimals:

5% 20% 7% 15% 25% 16% 18% 24% 50% 75%.

3. Show by equivalent decimals that naughts added to the right of a decimal do not affect its value.

4. Write as decimals, and as per cents:

$\frac{1}{2}$ $\frac{3}{4}$ $\frac{1}{20}$ $\frac{1}{25}$ $\frac{1}{10}$ $\frac{2}{5}$ $\frac{4}{5}$ $\frac{3}{8}$

5. What is the difference between .05 of \$100 and 5% of \$100?

6. $5\% = \frac{?}{20}$ of a number; $10\% = \frac{?}{10}$ of a number.

7. 25% of \$100 may be found in two ways: (*a*) $25\% = \frac{1}{4}$; $\frac{1}{4}$ of $\$100 = \$25$. (*b*) $25\% = .25$; $.25 \times \$100 = \$25$.

Learn the following:

$50\% = \frac{1}{2}$	$16\frac{2}{3}\% = \frac{1}{6}$	$75\% = \frac{3}{4}$
$33\frac{1}{3}\% = \frac{1}{3}$	$12\frac{1}{2}\% = \frac{1}{8}$	$40\% = \frac{2}{5}$
$25\% = \frac{1}{4}$	$10\% = \frac{1}{10}$	$80\% = \frac{4}{5}$
$20\% = \frac{1}{5}$	$5\% = \frac{1}{20}$	$37\frac{1}{2}\% = \frac{3}{8}$

Give per cents at sight:

8. 20% of \$50

9. 25% of \$60

10. 10% of \$40

11. 50% of \$80

12. 40% of \$75

13. 5% of \$40

14. 6% of \$6

15. 75% of \$20

16. $12\frac{1}{2}\%$ of \$72

17. $33\frac{1}{3}\%$ of 30 days.

18. 50% of 60 minutes.

19. 75% of 100 books.

20. 40% of 20 rods.

21. 5% of 40 weeks.

22. $16\frac{2}{3}\%$ of 100 pounds.

23. 10% of 70 bushels.

24. 25% of 24 hours.

25. $12\frac{1}{2}\%$ of 800 bushels.

Written Work

1. Find 28% of 7500 bushels of oats.

$$\begin{array}{r} 7500 \text{ bu.} \\ \underline{.28} \\ 60000 \\ \underline{15000} \\ 2100.\cancel{0}\cancel{0} \text{ bu.} \end{array}$$

Since percentage is simply so many hundredths of anything, 28% of 7500 bushels equals .28 of 7500 bushels, or 2100 bushels.

Find:

2. 27% of $395
3. 11% of $478
4. 24% of $527
5. 6% of $57.40
6. 5% of $90.80
7. 35% of $90.60
8. 40% of $20.50
9. 10% of $2004
10. 5% of $200.60
11. 7% of $500.50
12. 75% of $605
13. 37% of $2005
14. 45% of $6745
15. 80% of $905
16. 98% of $7008

17. Mr. Jordon bought a horse for $175 and sold it for 90% of the cost. For how much did he sell the horse?

18. Raymond has $165 in the savings bank and Bertha has 80% as much. How much more money has Raymond in the bank than Bertha?

19. The distance between two cities is 1080 miles. After 45% of the distance is traveled, how much of the distance remains to be traveled?

20. Mr. Watson earned $1580 in a year, and his son Henry 65% as much. Find the amount Henry earned.

21. The salary of a school teacher last year was $40, and this year her salary was increased 25% of last year's salary. Find her present salary.

22. Paul lives 560 rods from the schoolhouse and David 72 % as far. Find the number of rods David lives from the schoolhouse.

23. Mr. Adams borrows $365 for one year, and pays 6 % for the use of the money for the time. How much money will pay the debt when due?

24. Mr. Brown has loaned $1200 to one party and $1600 to another party. How much does Mr. Brown get each year for the use of the money if each party pays him 5 % of the amount borrowed?

25. Find 5 % of 20, of 40, of 50, of 60, of 80.

26. A newsboy sells $18 worth of papers and gets 40 % for selling. How much does he earn?

27. Mary has $24 in the savings bank, and deposits 25 % as much as she has in the bank. Find the amount deposited.

28. A boy borrows $200 to go to school, and pays the lender 5 % for the use of the money for one year. How much does he pay for its use?

29. A boy bought a pony and a cart. The pony cost $80, and the cart 60 % as much as the pony. Find the total cost.

30. A man had 400 sheep. On Monday he sold 25 % of them. On Tuesday he sold 25 % of the remainder. How many sheep had he then?

31. In a spelling test of 30 words, James missed 20 %. How many words did he spell correctly?

32. $\frac{1}{4} = \frac{?}{100}$ = ? %. Compare $\frac{1}{5}$ and .20, $\frac{1}{5}$ and 20 %.

33. A man bought a house for $2800. He paid 78 % of the amount cash, and gave his note for the balance. For how much did he give his note?

34. A merchant sold in one year $25,375 worth of goods. His profits were 20 % of the sales. Find his profits.

INTEREST

1. Mr. James Adams borrows $200 from Mr. John Buchanan for 2 years to send his son to school, and agrees to pay Mr. Buchanan 6 % of the money for the use of it each year. How much does it cost Mr. Adams for the use of the money the first year? How much does it cost Mr. Adams for the use of the money for the 2 years?

2. If Mr. Adams settles with Mr. Buchanan at the end of two years, how much in all does he give Mr. Buchanan?

Interest is money paid for the use of money.

The **principal** is the sum of money on which the interest is paid.

The **rate of interest** is a certain number of hundredths of the principal paid for the use of the principal for 1 year.

The **amount** is the sum of the principal and the interest.

In finding interest it is always necessary to know the *time.* The interest for 2 yr. equals 2 times the interest for 1 yr.; the interest for 6 mo. equals $\frac{1}{2}$ the interest for 1 yr.; the interest for 2 mo. equals $\frac{1}{6}$ the interest for 1 yr.

3. In Prob. 1 what is the principal? the rate of interest? the interest for 1 yr.? the interest for 2 yr.? the amount at the end of 2 yr.?

How much is the interest at 6 % on:

4. $100 for $1\frac{1}{2}$ yr.?

5. $200 for $2\frac{1}{2}$ yr.?

6. $300 for $1\frac{1}{4}$ yr.?

7. $250 for 6 mo. ($\frac{1}{2}$ yr.)?

8. $400 for $1\frac{3}{4}$ yr.?

9. $800 for $2\frac{3}{4}$ yr?

10. $150 for 3 mo. ($\frac{1}{4}$ yr.)?

11. $80 for 2 yr.?

12. $200 for $\frac{3}{4}$ yr.?

13. $100 for $2\frac{1}{4}$ yr.?

14. $900 for $1\frac{3}{4}$ yr.?

15. $750 for $1\frac{1}{2}$ yr.?

INTEREST FOR YEARS AND MONTHS

1. What part of a year are 6 months? 4 months? 3 months? 2 months? 1 month?

Written Work

1. What is the interest on $200 for $2\frac{1}{2}$ years at 6%?

$200 principal
.06 rate
$12.00 interest for one year
$2\frac{1}{2}$
$30.00 interest for $2\frac{1}{2}$ years

The interest for 1 year is .06 of the principal, or $12. The interest for $2\frac{1}{2}$ years is $2\frac{1}{2}$ × $12, or $30.

Multiply the principal by the rate and the product by the number of years.

Find the interest on:

2. $200 for 1 year at 5%.
3. $900 for 2 years at 8%.
4. $150 for 3 years at 6%.
5. $700 for 4 years at 4%.
6. $150 for $1\frac{1}{2}$ years at 4%.
7. $96 for 2 years at 8%.
8. $75 for $3\frac{2}{3}$ years at 7%.
9. $150 for $4\frac{1}{2}$ years at 5%.
10. $190 for $2\frac{1}{2}$ years at 6%.
11. $600 for $2\frac{1}{3}$ years at 4%.
12. $950 for 9 mo. at 6%.
13. $940 for $2\frac{3}{4}$ years at 7%.
14. $650 for $\frac{3}{4}$ year at 6%.
15. $225 for $\frac{7}{8}$ year at 8%.

Find the interest and amount at 6% of:

16. $200 for 6 months.
17. $400 for 4 months.
18. $150 for 2 yr. 2 mo.
19. $620 for 3 mo.
20. $270 for 8 mo.
21. $350 for 9 mo.

22. Frank loaned Mr. Brown $250 for 2 years and 6 months at 6% interest. How much money will it take to pay the loan?

OPERATIONS WITH UNITED STATES MONEY

10 mills = 1 cent
10 cents = 1 dime
10 dimes = 1 dollar
10 dollars = 1 eagle

1. From the above table tell why United States money is called a decimal system of money.

2. How many cents equal a dollar? What part of a dollar is 1 cent?

3. A cent is what part of a dime? A dime is what part of a dollar? Cents are written as hundredths of a dollar.

4. Read as hundredths of a dollar:

$0.01 $0.02 $0.03 $5.07 $9.09 $8.07.

NOTE.—1 cent may be written either $0.01 or $.01; 25 cents may be written either $0.25 or $.25, etc. The naught preceding the decimal point does not affect the result, and is sometimes written to show more prominently that cents and not dollars are represented.

5. How many mills equal $1? What part of a dollar is 1 mill? Mills are written as thousandths of a dollar. Thus, 1 mill is written $0.001. $0.005 may be read one half cent. Why?

Mills are not coined, but are used for convenience in computations. In final results any part of a cent is usually regarded by the seller as a whole cent. Thus, for a bill amounting to $0.565, we pay $0.57.

6. How does moving a number one place to the right affect its value? one place to the left?

The rules for addition, subtraction, multiplication, and division of decimals apply to United States money since it is a *decimal system.*

Written Work*

1. Find the cost of 27 yards of silk at \$ 0.87½ a yard.

$$\begin{array}{r} \$\,0.875 \\ 27 \\ \hline 6125 \\ 1750 \\ \hline \$\,23.625 \end{array}$$

Study of Problem

1. Why do we change ½ ¢ to 5 mills?
2. What is the name of the right-hand place in the product?
3. What is the business answer to this problem.

Find the cost of :

2. 4 yd. of lace @ \$0.37½.

3. 6 bu. of potatoes @ \$ 0.62½.

4. 9 doz. eggs @ \$ 0.12½.

5. 8 lb. of roast @ 11½ ¢.

6. 25 bu. apples @ \$ 1⅛.

7. 36 cords of wood @ \$3⅜.

Find the amount of :

8. 23 yd. of cloth @ 12½ ¢.
14 boxes corn starch @ 8 ¢.
31 lb. of raisins @ 30 ¢.

9. 14 cakes of soap @ 2½ ¢
37 boxes macaroni @ 12½ ¢.
14 cans of soup @ 10 ¢.

10. At \$ 1.50 each, how many readers can be bought with \$ 6.00 ?

150 ¢)600 ¢(4 times or readers.
600

When the divisor contains cents, both dividend and divisor may be changed before dividing.

11. At \$ 1.25 each, how many pairs of gloves can be bought for \$ 57.50 ?

12. A farmer sold potatoes at 2 bushels for \$ 1.50. He received \$ 87.50. How many bushels did he sell ?

---

* For short methods of performing operations of this kind, see p. 175

13. Walters & Company sold sleds at 65 cents each. They received $31.20. How many dozen sleds did they sell?

14. Find the cost of boarding for 12 weeks at $7.50 a week.

15. A merchant bought $\frac{1}{2}$ dozen pairs of shoes at $2.75 a pair. How much was paid for all?

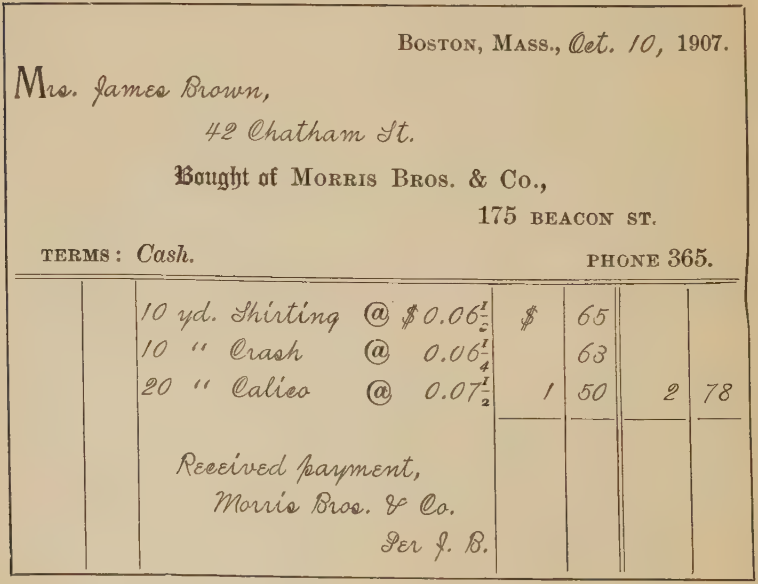
16. A bookseller sold 56 books at 0.12\frac{1}{2}$ each, 37 books at $0.40 each, and 75 books at $0.25 each. How much money did he receive for all?

17. At $.02$\frac{1}{2}$ each, how much will 1 gross of tablets cost?

18. A man paid $43.75 for carpet at $1.75 a yard. How many yards did he buy?

BILLS

The following is a common form of *bill.*



BOSTON, MASS., *Oct. 10,* 1907.

Mrs. James Brown,
42 Chatham St.

Bought of MORRIS BROS. & CO.,
175 BEACON ST.

TERMS: *Cash.* PHONE 365.

		10 yd. Shirting @ 0.06\frac{1}{2}$	*$*	*65*		
		10 " Crash @ 0.06$\frac{1}{4}$		*63*		
		20 " Calico @ 0.07$\frac{1}{2}$	*1*	*50*	*2*	*78*
		Received payment, *Morris Bros. & Co.* *Per J. B.*				

Who sold the goods? Who purchased the goods? When and where was the purchase made? What words show that the bill has been paid?

The words "Received payment, Morris Bros. & Co.," are called the **receipt** of the bill. Who received the money? When a clerk receives payment for a bill, he always writes the receipt of the firm, per his own name or initials. The receipted bill should be kept by the buyer to show that the bill has been paid.

Every bill should show: (*a*) the *place* and *date* of purchase; (*b*) the *names* of the buyer and the *seller;* (*c*) the *quantity*, the *price*, and the *cost* of each item, and the *amount* of the bill.

1. Mrs. James Robinson, on a certain day, buys from Morris Bros. & Co., 12 cans of Acme corn @ \$0.12$\frac{1}{2}$, 18 pounds sugar for \$1.00, 3 pecks potatoes @ \$0.25.

Make out the receipted bill.

Make out receipted bills for the following sales, using your father's name as buyer, and the name of your local merchant as seller:

2.	$3\frac{1}{2}$ lb. rice	@	\$0.08.	**3.**	12 yd. muslin	@	\$0.09.
	10 lb. prunes	@	0.12$\frac{1}{2}$.		10 yd. lace	@	0.12$\frac{1}{2}$.
	2 bags salt	@	0.10.		2 pair socks	@	0.35.

4. William Thomas bought of J. A. Crawford & Co., New Castle, Pa., Oct. 10, 1905, 15 lb. butter at 28¢ per lb.; 10 doz. eggs at 24¢ per doz.; 35 lb. lima beans at 11¢ per lb. Make out receipted bill, representing yourself as clerk.

5. Mrs. J. M. Rowe bought of Johnston & Son, Buffalo, N.Y., Dec. 22, 1905, 2 dressed turkeys weighing 12$\frac{1}{2}$ lb. and 13 lb. respectively, at 22¢ per lb.; 5 lb. of lamb chops at 19¢ per lb. Clerk, James Brown.

6. W. M. Hays & Son, Baltimore, Md., dealers in general merchandise, sold to Frank N. Clark, Jan. 12, 1905, the following bill of goods:

$7\frac{3}{4}$ lb. butter @ 24¢; 6 lb. cheese @ $11\frac{1}{2}$¢; 14 yd. calico @ $7\frac{1}{2}$¢; 1 can lard, weighing $8\frac{3}{4}$ lb., @ 12¢.

Supposing that you are the clerk and some neighbor is the buyer, make out receipted bills for the following purchases at your local stores:

7. $8\frac{1}{2}$ lb. lard @ 10¢; 6 cans corned beef @ 15¢; $8\frac{1}{2}$ lb. ham @ $14\frac{1}{2}$¢; 8 lb. sausage @ $12\frac{1}{2}$¢.

8. 3 hassocks @ 98¢; 6 chairs @ $1.25; 12 yd. carpet @ $1.10; 2 rockers @ $2.90; 1 lamp @ $1.65.

9. 1 saw @ 75¢; 3 gas heaters @ $4.90; $3\frac{1}{2}$ doz. screws @ 12¢; $10\frac{1}{2}$ lb. lawn seed @ 20¢; 8 joints stove pipe @ 30¢; 2 elbows @ 40¢.

Another form of bill is commonly used when services have been rendered, as well as material furnished. For example:

AKRON, OHIO, June 1, 1907.

Mr. J. R. Burroughs,

To R. W. Jones, Dr.

		To 6 days' Labor	*@ $1.50*	*$9*	*00*		
		6 lb. Lawn Seed	*@ 0.25*	*1*	*50*		
		8 lb. Nails	*@ 0.06*		*48*	*10*	*98*
		Received Payment, *June 18, 1907.* *R. W. Jones.*					

The **creditor** is the person who sells the goods or does the work.

The **debtor** is the person who buys the goods or for whom the work is done.

In the bill on p. 98 Mrs. Brown is *debtor* to Morris Bros., since she owes for the goods purchased, and Morris Bros. are the creditors, since they furnished the goods. In the last bill on p. 264 Mr. Burroughs is the *debtor* for work received, and Mr. Jones is the creditor for work he has done.

1. T. S. Ball owes Dr. S. N. Pool, Lloyd Building, Pittsburg, Pa., for services as follows: Jan. 1, 1907, to 1 call, $2; Jan. 12, 1907, to 1 call, $2; Jan. 14, 1907, office, $1; Jan. 16, 1907, to 1 call, $2. Make out and receipt the bill if paid Feb. 1, 1907.

2. Boydson & Co. owe Charles Frampton, Detroit, Mich., for services as follows:

March 10, 1907, 6 hr. delivering goods @	$ 0.20
March 11, 1907, trip to country	2.00
March 12, 1907, " " "	2.00
March 13, 1907, " " "	2.00
March 14, 1907, repairs to wagon	3.75

Write the receipted bill of Boydson & Co., if paid April 1, 1907.

3. James Brown owes Stamm Bros. for labor and material as follows: June 1, 1907, 189 ft. lumber at 8¢ per foot; June 4, 1907, 50 lb. cement at 4¢ per pound; June 8, 1907, 15 days labor at $4.50 per day.

Receipt this bill if paid July 1, 1907.

DENOMINATE NUMBERS

Liquid Measures

A gallon, a quart, and a pint measure should be brought into class. Pupils should measure, and thus learn the relative capacities.

Liquid measures are used in measuring liquids.

2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)
$31\frac{1}{2}$ gallons = 1 barrel (bbl.)
63 gallons = 1 hogshead (hhd.)
1 gallon = 231 cubic inches
1 gal. = 4 qt. = 8 pt. = 32 gi.

1. How many pints equal a gallon? a half gallon?

2. How many quarts equal 16 pints? 24 pints? 36 pints?

3. How many gallons equal 28 quarts? 12 qt.? 32 qt.?

Written Work

1. Change 4 gal. 2 qt. 1 pt. to pints.

$4 \text{ gal.} = 4 \times 8 \text{ pt.} = 32 \text{ pt.}$
$2 \text{ qt.} = 2 \times 2 \text{ pt.} = 4 \text{ pt.}$
$1 \text{ pt.} = 1 \text{ pt.}$
$4 \text{ gal. } 2 \text{ qt. } 1 \text{ pt.} = 37 \text{ pt.}$

Since there are 8 pints in 1 gallon, in 4 gallons there are 4 times 8 pints or 32 pints. Since there are 2 pints in 1 quart, in 2 quarts there are 2 times 2 pints, or 4 pints. 32 pints + 4 pt. + 1 pt. = 37 pt. Hence, 4 gal. 2 qt. 1 pt. = 37 pt.

Change:

2. 6 gal. 1 pt. to pints.

3. 8 gal. 1 qt. 1 pt. to pints.

4. 4 gal. 3 qt. to pints.

5. 5 gal. 2 qt. 1 pt. to pints.

6. Change $\frac{7}{8}$ gal. to pints.

7. Mary bought $3\frac{1}{2}$ gallons of cream at 10¢ a pint. How much did it cost her?

8. A grocer sold $6\frac{1}{4}$ gallons of vinegar at 8¢ a pint. How much did he receive for it?

9. Change 127 pt. to gallons, etc.

2)127, no. of pints.
4)63, no. of qt. + 1 pt.
15, no. of gal. + 3 qt.
127 pt. = 15 gal. 3 qt. 1 pt.

Since 2 pints = 1 quart, there will be $\frac{1}{2}$ as many quarts as pints; that is, 63 qt. + 1 pt. Since 4 quarts = 1 gallon, there will be $\frac{1}{4}$ as many gallons as quarts; that is, 15 gal. + 3 qt.

NOTE. — The numbers in the operation must be regarded as abstract. Do not say 127 pints ÷ 2 = 63 *quarts* + 1 pint. It is evident that 127 pints ÷ 2 would equal $63\frac{1}{2}$ *pints*.

Change:

10. 375 pt. to quarts, etc.

11. 846 pt. to quarts, etc.

12. 278 pt. to gallons, etc.

13. 675 pt. to gallons, etc.

14. 469 qt. to gallons, etc.

15. 875 qt. to pints.

16. 13 gal. to quarts.

17. 144 gal. to pints.

Dry Measures

Dry measures are used in measuring grain, fruit, roots, and other dry articles. Name five articles sold by the bushel.

2 pints (pt.) = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)
1 bushel = 2150.42 cubic inches
1 bu. = 4 pk. = 32 qt. = 64 pt.

1. Find, by measuring, how many pecks equal a bushel.
2. How many quarts will fill a peck measure?
3. How many quarts will fill a bushel measure?
4. How many bushels do 16 pecks equal? 64 quarts?

Written Work

Change:

1. 3 bu. 2 pk. 6 qt. to pints.
2. 96 pt. to bushels.
3. 1200 qt. to bushels.
4. 65 pk. to bushels.
5. 8 bu. 3 pk. 1 pt. to pints.
6. 1500 pt. to bushels.

Avoirdupois Weight

The teacher should secure a scale and weights, and have pupils weigh articles of different kinds.

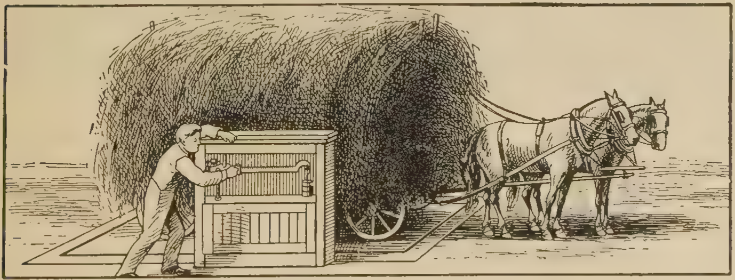
Avoirdupois weight is used in weighing heavy articles; as, groceries, coal, grain, and metals, except gold and silver.

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
20 hundredweight
2000 pounds } = 1 ton (T.)
2240 lb. = 1 long ton
1 T. = 20 cwt. = 2000 lb = 32,000 oz.

The **long ton** is used at the United States custom houses, and in wholesale transactions in coal and iron.

The avoirdupois pound contains 7000 grains, and the avoirdupois ounce, 437½ grains.

The unit of avoirdupois weight is the **pound.**



1. Name several kinds of articles sold by the pound; by the ton.

2. How many tons equal 6000 pounds? 24,000 pounds?

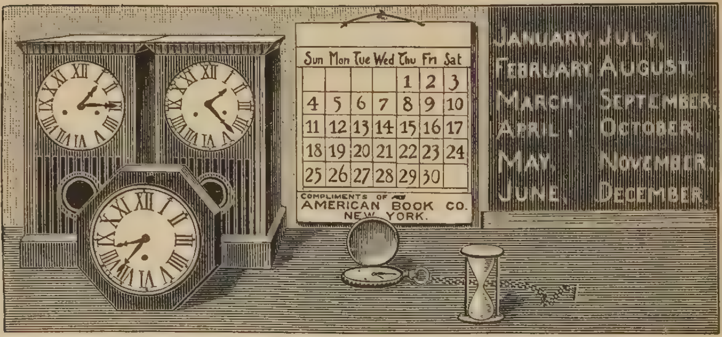
3. Find the cost of 2½ tons of hay at $14 a ton.

Written Work

Change:

1. 6 lb. 5 oz. to ounces.
2. 3 T. 8 cwt. to pounds.
3. 4 cwt. 3 lb. to ounces.
4. $5\frac{1}{2}$ cwt. to ounces.
5. 3600 lb. to cwt.
6. 2 T. 5 lb. to ounces.
7. 544 oz. to pounds.
8. 6000 lb. to tons.
9. 128 oz. to pounds.
10. 810 oz. to lb. and oz.

Time Measures


Sun Mon Tue Wed Thu Fri Sat
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COMPLIMENTS OF AMERICAN BOOK CO. NEW YORK.
JANUARY. JULY.
FEBRUARY. AUGUST.
MARCH. SEPTEMBER.
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MAY. NOVEMBER.
JUNE. DECEMBER.

Time measure is used in measuring time. There are two standard units of time, the **day** and the **year**.

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
1 year = 12 mo. = 365 or 366 days = 52 wk. 1 da. or 52 wk. 2 da.

1. How many hours is it from midnight on Tuesday to midnight on Wednesday?

2. At what time does the new day begin?

3. How many times in a day does the hour hand pass around the face of the clock?

4. What part of an hour are 10 minutes? 45 min.?

5. What part of a minute are 15 seconds? 30 sec.?

6. What do you mean by A.M.? by P.M.? by M.?

7. Read the time on each of the clocks in the picture.

8. A man leaves home at 6:30 A.M. and returns at 5:45 P.M. How long is he away from home?

9. A train leaves the station at 11:10. It requires 25 minutes to reach the station. At what time must one leave home in order to catch this train?

10. Harry leaves for school at 8:30, and reaches school at 3 minutes before 9 o'clock. How long is he on the way?

11. The morning session of school begins at 9 A.M. and closes at 11:30 A.M. The afternoon session begins at 1 P.M. and closes at 3:45 P.M. How long are both sessions?

12. How many months have 31 days each? 30 days each? 28 days? When has February 29 days?

Written Work

Change:

1. 3 hr. 6 min. to seconds.

2. 144,000 sec. to days.

3. 5 da. 3 hr. to minutes.

4. 108 mo. to days.

5. 12 wk. 6 da. to hours.

6. 336 hr. to weeks.

7. 5760 min. to days.

8. 30 days to seconds.

9. If the school is in session $5\frac{1}{2}$ hours, how many seconds is it in session?

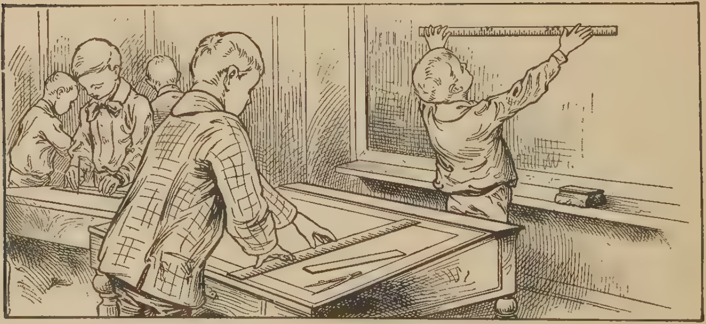
10. At $\$1\frac{1}{2}$ a day, how much will a boy earn in 14 days?

11. If a motorman receives 20¢ an hour, what is his pay for 6 days of 9 hours each?

12. A clerk pays $4.50 a week for board. How much will his board cost him for September, October, and November?

13. At the rate of $\$\frac{3}{4}$ a day, how much can a boy earn during the month of February?

Distance



The teacher should bring into the class a yard stick and a 50-foot measuring line. Each pupil should be provided with a 12-inch ruler, with inches and half inches clearly marked.

Linear measure is used in measuring lines and distances.

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
$5\frac{1}{2}$ yards } = 1 rod (rd.)
$16\frac{1}{2}$ feet }
320 rods = 1 mile (mi.)
1 mi. = 320 rd. = 1760 yd. = 5280 ft.

1. Measure the length of a book; of a desk; of a table.

2. Measure the yard stick with the ruler. How many feet equal a yard? A foot is what part of a yard?

3. With the measuring line mark off $16\frac{1}{2}$ ft., or 1 rod, on the blackboard.

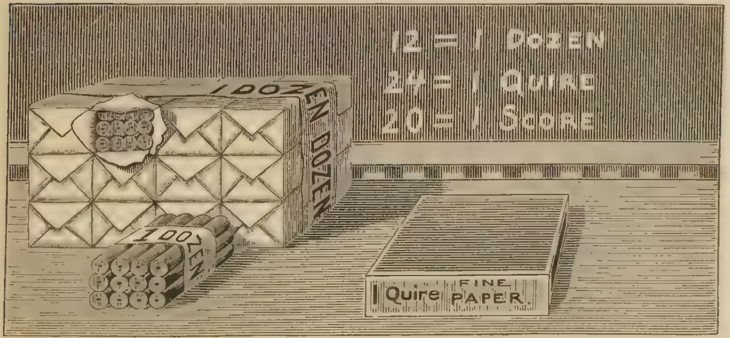
4. How many yards are there in $16\frac{1}{2}$ ft.? in 320 rd.?

Written Work

Change:

1. 33 ft. to inches.
2. 12 yd. to feet.
3. 28 rd. to yards.
4. $\frac{1}{2}$ mi. to inches.
5. 3 yd. 2 ft. 6 in. to inches.
6. 4 rd. 3 yd. 1 ft. to feet.
7. 1728 in. to yards.
8. 198 in. to rods.

Miscellaneous Measures



There are 12 **dozen in a gross.**

1. How much will 1 gross buttons cost at 15¢ a dozen?

2. A stationer bought 12 quires of paper for $1.20 and sold it at a cent a sheet. How much did he gain?

3. Find the cost of 40 lemons at 15¢ a dozen.

REVIEW

1. A bicycle wheel is 7 feet 4 inches in circumference. How many turns will it make in going 6 miles?

2. How much will $3\frac{1}{2}$ bushels of plums cost at 9 ¢ a quart?

3. How much fence will be needed to inclose a square field, each side of which is 22 rods?

4. If 9 boxes weigh 27 pounds, how much will 36 boxes weigh? How much will 3 boxes weigh?

5. George has a can of milk containing 10 gallons. If he sells 10 quarts to his first customer, 4 quarts to the second customer, 3 gallons to the third customer, and 2 gallons 1 pint to the fourth, how much has he left in the can?

6. How much are $5\frac{1}{2}$ miles of telegraph wire worth at $0.005 a foot?

7. Our grocer found that 9 hams weighed $82\frac{7}{8}$ pounds. What was the average weight?

8. How much must be paid for 15 gross of lead pencils at 35 ¢ a dozen?

9. Walter picked $4\frac{1}{4}$ bushels of blackberries and sold them to a grocer for 6 ¢ a quart. He took in exchange eggs at 24 ¢ a dozen. How many dozen did he receive?

10. A butcher sold $30\frac{1}{4}$ pounds of lard at $0.12 a pound, and purchased with the money flour at $0.03 per pound. How much flour did he buy?

11. 500 bushels of peaches were packed in baskets, each holding 2 pecks. How many baskets were needed?

12. 20 hundredweight of starch was packed into boxes, each containing 5 pounds. How much was received, if each box was sold for $6\frac{1}{4}$ ¢?

13. Count the change from a five-dollar bill for 8 pounds of steak at 18¢ a pound, 3 cans of tomatoes at 96¢ a dozen, and 2 gallons of gasoline at 15¢ a gallon.

14. What is my January milk bill, if I use 5 pints every day, at 8¢ a quart?

15. If $\frac{5}{8}$ of a ton of coal costs $3.75, how much will $3\frac{1}{2}$ tons cost?

16. How many pint cans can be filled from 26 gallons of tomato soup?

17. The Bell Telephone Co. charges me $40 a year for 600 calls. How much is that per month? how much for each of the calls?

18. Find the amount of the following sales:

1 dozen boxes of cocoa at 15¢ a box,
8 cans of tomatoes at $1 a dozen,
3 boxes of figs at $3 a dozen,
$11\frac{1}{2}$ pounds turkey at 22¢ a pound.

19. Five girls weigh 75 pounds, 86 pounds, 93 pounds, 69 pounds, and 72 pounds respectively. What is their average weight?

20. There are 20 quires in a ream. At $1.20 a ream, find the cost of 3 reams, 3 quires of paper.

21. How old is a man who is threescore years and ten?

22. The Adams Coal Company sold 8 loads of coal as follows: 2470 lb., 3680 lb., 1974 lb., 2985 lb., 1741 lb., 3164 lb., 3749 lb., and 4278 lb. Find the number of tons, hundredweight, and pounds sold.

PRACTICAL MEASUREMENTS

LENGTHS AND SURFACES

Lines that meet, making a square corner, form a **right angle**.

A figure that has four straight sides and four right angles is called a **rectangle**.

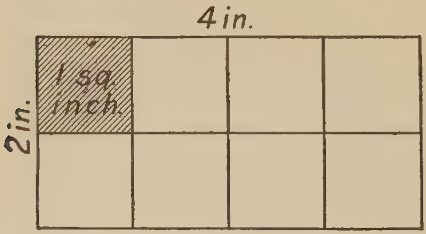
A rectangle having its four sides equal is called a **square**.

Rectangles that are not squares are sometimes called **oblongs**.

144 sq. in. = 1 sq. ft.
9 sq. ft. = 1 sq. yd.

The **perimeter** is the distance around a surface.

What is meant by drawing a surface on a scale of 1 inch to 2 feet? On what scale is this surface drawn? What is the *unit* of measure? How many units are there in the first row of squares? in the second? How many square inches are there in the rectangle, or what is its **area**?



2 × 4 × 1 *sq. in.* = 8 sq. in., area.

The **area of a rectangle** *is a number of square units equal to the product of its two dimensions when expressed in like units.*

Thus, if the dimensions of a rectangle are 2 inches and 4 inches, the area is 8 square inches; if the dimensions are 2 feet and 4 feet, the area is 8 square feet.

Written Work

1. If a pane of glass is 10 inches by 12 inches, how many square inches does it contain?

2. How many square feet of glass equal 32 such panes?

3. A garden is 73 feet by 50 feet. How many square feet does it contain?

4. The page of a book is $7\frac{1}{4}$ inches by 5 inches. How many square inches are there on the page?

5. How many square inches are there in a page of your book?

6. Measure the blackboard in your schoolroom and find how many square feet it contains.

NOTE.—Reduce inches to the fraction of a foot; as, 8 ft. 6 in. $= 8\frac{1}{2}$ ft.

7. How many square inches are there in the surface of your schoolroom door?

8. At $\$1\frac{1}{5}$ per square yard, how much will it cost to cover a floor 12 feet by 15 feet with linoleum?

9. A plate glass window is 9 feet 8 inches wide and 12 feet 3 inches long. How much will such a window cost at $0.36 per square foot?

10. Brussels carpet is $2\frac{1}{4}$ feet wide. How many square feet are there in a yard of it?

11. A room is 16 feet long and 14 feet wide. How much will it cost to paint the ceiling of this room at 12¢ per square yard?

12. Which is the larger, a surface 26 in. long and 5 in. wide or a surface 20 in. long and 12 in. wide?

13. At 15¢ per square foot, how much does a sidewalk 50 feet long and 5 feet wide cost?

14. At 12¢ per square foot, how much will it cost to cement the floor of a cellar 28 ft. 4 in. by 22 ft. 6 in.?

15. At $1.05 per square yard, how much will it cost to pave the street in front of a 50-foot lot, the street being 33 feet wide between the curbs?

16. Compare a square 1 inch on a side with a square 2 inches on a side. Prove your work by drawing the required squares and dividing them into square inches.

17. Compare a rectangle 2 inches by 8 inches with a rectangle 4 inches by 16 inches.

18. Show that a square 4 inches on a side is 16 times as large as a square 1 inch on a side.

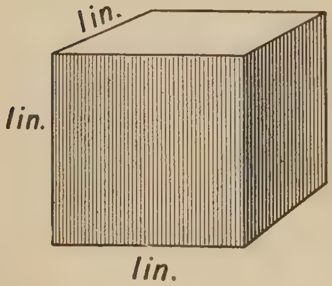
19. Name and draw the figures you have learned in which all the angles are right angles.

20. What other name is sometimes given to a rectangle? Is a square a rectangle? When is a rectangle *not* a square? Draw figure to illustrate.

21. Name the different measures of length.

22. Lines have what dimensions? Surfaces have what dimensions? Illustrate each.

VOLUME



1. What is the length of the figure? the width? the height?

2. How many dimensions has it?

3. How many sides or faces has it?

4. Show that each side is a square.

5. How many square surfaces has it?

A solid with six equal square surfaces is a **cube**.

6. Look at the figure and tell how many edges it has. What is the length of each edge?

A cube whose edge is 1 inch is called a **cubic inch.**

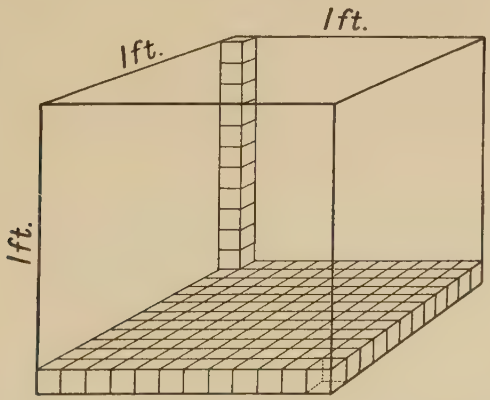
7. Draw on paper or on the blackboard a square foot.

8. Divide each side into 12 equal parts and connect them by straight lines.

9. How many square inches equal a square foot?

10. The base of a 1-inch cube has how many square inches?

11. 144 cubes 1 inch on an edge can be placed on a surface of 1 square foot thus:

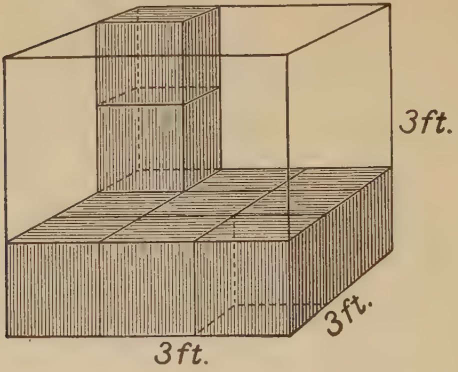


12. What is the height of 12 such layers of cubes? How many cubic inches are there in the first layer? in 12 layers?

13. How many cubic inches can be placed in the cube?

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)

SURFACES AND VOLUMES



1. How many feet on an edge is the cube in the figure above?

2. How many cubes 1 foot on an edge are there in the first layer?

3. How many cubes 1 foot on an edge are there in the 3 layers?

27 cu. ft. = 1 cubic yard (cu. yd.)
A cart load of earth = 1 cu. yd.

The **contents,** *or* **volume,** *of any body that has six rectangular surfaces is a number of cubic units equal to the product of its three dimensions when expressed in like units.*

4. A schoolroom is 30 ft. wide, 40 ft. long, and 16 ft. high. Find the number of cubic feet of air in it.

5. Find the number of cubic yards of air in the room.

6. A piece of timber is 1 ft. square at the end and 12 ft. long. How many cubic feet are there in it?

7. How many 1-in. cubes are necessary to make a rectangular solid 12 in. long, 8 in. wide, and 4 in. high?

8. A box is 4 ft. long, 2 ft. wide, and 2 ft. high. Find the number of square feet in its six surfaces.

9. Find the number of cubic inches in the box.

10. A bin for grain is 12 ft. long, 8 ft. wide, and 5 ft. deep. Find the number of cubic feet in it.

11. If there are 2150.42 cu. in. in a bushel of wheat, find the number of bushels of wheat the bin will hold.

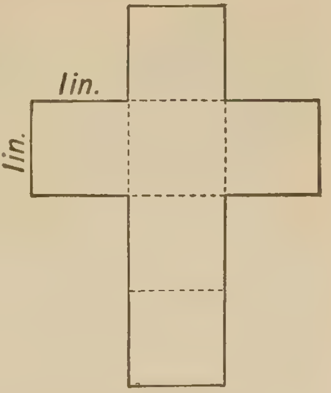
12. A water tank is 8 ft. long, 4 ft. wide, and 3 ft. deep. If a cubic foot of water weighs $62\frac{1}{2}$ lb., find the weight of the water when the tank is full.

13. A stone wall is 40 ft. long, 4 ft. high, and 2 ft. thick. Find the number of cubic feet of stone in it.

14. Measure the dimensions of your schoolroom and find the number of cubic feet of air in it.

15. A rectangular solid is 1 ft. square and 4 ft. long. Find the surface of its six faces.

16. Cut from cardboard a surface as shown in the drawing. Fold along the dotted lines into a box; find the surface of the six faces and the contents of the box in cubic inches.



17. Measure the walls and ceiling of your schoolroom and find the cost of plastering them at 27 cents per square yard.

18. Cut from cardboard a diagram to show a rectangular box 18 in. long, 12 in. wide, and 8 in. deep.

19. Find the number of cubic inches in the box.

20. Measure the surface of your schoolroom floor, and find the cost of oiling it at 12 cents per square yard.

21. What is the difference in cubic feet between 9 cubic feet and a cube 3 feet on an edge?

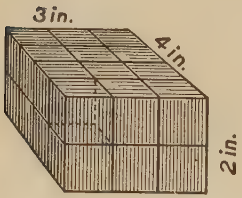
To the Teacher. — Get, if possible, 144 cubical blocks 1 inch on an edge.

22. Build a cube 3 blocks on an edge. How many cubic inches are there in the cube?

23. Build a cube 4 blocks on an edge. How many cubic inches are there in the cube?

24. Build a cube 2 blocks on an edge. How many cubic inches are there in the cube?

25. The cube 4 blocks on an edge is how many times the cube 2 blocks on an edge?



26. Build a rectangular solid as shown in the figure. How many cubic inches are there in the solid?

27. Show that the solid in problem 24 has 6 rectangular surfaces. Find the surface of each rectangle.

28. Build a cube 5 inches on an edge. How many more than 100 cubes are needed?

29. Find the cost, at 30 cents a cart load (1 cubic yard), for excavating the ground for a cellar 30 ft. in length, 20 ft. in width, and 4 ft. in depth.

30. A laborer digs a ditch 100 ft. long, 18 in. wide, and $2\frac{1}{2}$ ft. deep in 1 day. Find the number of cart loads of earth removed, and the cost at 30 cents a load.

GENERAL REVIEW

1. A clerk bought a gross of penholders for 80 cents and sold them at 2 cents each. How much did he gain?

2. I paid $3.65 for groceries, $1.75 for dry goods, and 87 cents for sundries. What was the cost of all?

3. Write one hundred two thousand, seven hundred.

4. Find the cost of 30 gross of writing tablets at 37½ cents a dozen.

5. If 11¼ is subtracted from a certain number 1¼ will remain. What is the number?

6. A merchant pays 6½¢ a yard for muslin and sells it for 7¼¢ a yard. What is his gain on 24 yards?

7. I can make 3 aprons in 6 hours. How many aprons can I make in 12 hours?

8. Write in words 4006.015.

9. A man bought ⅓ of a farm containing 300 acres and sold .25 of his share. How many acres had he left?

10. If 8 loads of hay cost $80, what is the cost of 24 loads?

11. Change 12 gallons, 2 quarts, 1 pint, to pints.

12. Robert rides 14.75 miles north on his pony, and his brother James rides 20.25 miles south. How far apart are they at the end of the ride?

13. At Horne's sale a customer bought three remnants of silk, containing respectively 16¼ yd., 12 yd., and 9½ yd. How many yards of silk did the customer buy?

14. There are 5280 feet in a mile. How many feet is it from Albany to New York, a distance of 143 miles?

15. 6 is $\frac{3}{12}$ of what number?

16. At $50 a month rent, what is the income to the owner on 24 houses for 12 months?

17. At 95 cents per square yard, how much will it cost to cement the floor of a cellar 10 yards long and 6 yards wide?

18. Find the cost of 144 lb. of raisins at $8\frac{3}{4}$¢ a pound.

19. Add 8 bu. 1 pk. 3 qt.
4 bu. 3 pk. 2 qt.
2 bu. 1 pk. 5 qt.

20. Find the interest on a loan of $250 made for 2 years and 9 months at 6%.

21. Explain why it is wrong to say $2 times 325 yards.

22. How many feet of picture molding will be required for a room 18 ft. long and 12 ft. wide? At $6\frac{1}{4}$¢ a foot, how much will it cost?

23. Change $\frac{2}{3}$, $\frac{5}{8}$, and $\frac{7}{12}$ to 24ths.

24. Add $\frac{3}{4}$, $\frac{5}{8}$, $\frac{1}{2}$, and $\frac{7}{12}$.

25. Add by 3's to 54.

26. $32 \times 9\frac{3}{4}$ yards = ?

27. Change 8 square rods to a fraction of an acre; to a decimal of an acre.

28. Each of 8 boxes holds 5 pounds, 4 ounces of meal. How much do all the boxes hold?

29. What is the cost of 8 barrels of vinegar, averaging 41 gallons 3 quarts per barrel, at 18¢ a gallon?

30. In a warehouse there are 15 pillars 2 ft. by 18 in., and 20 ft. high. How many cubic feet are there in the pillars?

31. How much will it cost, at 27¢ a square yard, to paint a floor that is 18 ft. long and 16 ft. wide?

32. In the first column find the number of yards; in the second, the number of gallons; and in the third, the number of bushels.

Cost	Price per yd.	Cost	Price per gal.	Cost	Price per bu.
$3.20	6¼¢	$45.00	62½¢	$9.00	75¢
$6.72	12½¢	$36.60	16⅔¢	$15.00	33⅓¢
$8.40	20¢	$40.50	$1½	$21.75	37½¢

33. Charles spent at a sale 5 half dollars, 6 quarters, 3 dimes, 4 nickels, and 3 pennies. How much did he spend in all?

34. A motorman worked 8¾ hours one day, and 10½ hours another day. At 24¢ an hour, how much did he receive for the two days' work?

35. If 12 T. of hay cost $144, how much will 24 T. cost?

36. How many pounds of sugar, at $0.06 a pound, can be exchanged for 9 pounds of butter at $0.32 a pound, and 12 dozen eggs at $0.18 a dozen?

37. William works 6⅔ hours on each of 36 Saturdays. Find the amount earned at 12¢ per hour.

38. John earned $350 and loaned it for 1 yr. and 8 mo. at 5% interest. What was the amount when due?

39. If it takes 16¼ yards to make a dress, how many yards will it take to make 12 dresses?

40. How much will 128 clocks cost if 8 clocks cost $104?

41. A lady sold some butter at $0.32 a pound and with the sum received bought 16 yards of cloth at 90¢ a yard, 4 hats at $3 each, 4 ties at 24¢ each, and 4 pairs of gloves at 55¢ each. How many pounds of butter did she sell?

42. A father having $105.06 gave $97.08 to his son. If he divided the remaining amount equally between his two daughters, how much did each receive?

43. Find the cost of 81.25 acres of land at $46.75 an acre.

44. At $0.525 per bushel, how much corn can be bought for $52.50?

45. A dressmaker had 40 yd. of cloth. She used $12\frac{1}{4}$ yd. for a dress, $3\frac{3}{4}$ yd. for a coat, and $3\frac{1}{2}$ yd. for a waist. How many yards had she left?

46. Mr. White owned $\frac{3}{4}$ of a farm. He sold $\frac{1}{6}$ of his share at $60 an acre. If the entire farm contained 80 acres, how much money did he receive?

47. At $12\frac{1}{2}$ cents a dozen, how much will $\frac{3}{4}$ of 16 dozen buttons cost?

48. If $\frac{2}{3}$ of a dozen oranges cost 20 cents, how much will $5\frac{1}{3}$ dozen cost?

49. A company of four men leased a tract of West Virginia land and drilled an oil well. It flowed for a time at the rate of 100 barrels a day. If oil was selling at $1.68 a barrel, how much did each realize per day?

50. I paid $6.30 for ribbon. If I paid 60¢ for $\frac{2}{3}$ of a yard, how many yards did I buy?

51. A farmer lent his nephew $450 for 2 years and 6 months at 6%. Find the interest.

52. A bought a horse for $100, a cow for $$45\frac{1}{2}$, and a wagon for $$78\frac{3}{4}$. What was the cost of all?

53. $65 is the value of $\frac{5}{6}$ of an acre of land. At this rate how many acres of land can be bought for $6396?

54. Change 27000 pounds to tons.

55. One side of a square is 18 ft. 8 in. What is the distance around it?

56. If I spend $\$\frac{1}{2}$ for an inkstand, $\$\frac{3}{4}$ for a book, and $\$\frac{1}{4}$ for paper, how much do I spend in all?

57. Lucy has $\$\frac{1}{5}$, and Mary $\$\frac{3}{4}$. Which has the larger sum, and how much larger is it?

58. Charles earned $\$17\frac{1}{2}$, John $\$20\frac{1}{2}$, and William $\$25\frac{1}{4}$. How much more must they earn to have \$75 in all?

59. Perform the operations indicated : $\frac{5 \times 3.75}{1\frac{1}{2} \times 3\frac{1}{8}}$.

60. On Jan. 1, 1906, Mr. Blethrow bought of T. C. Jenkins & Co., the following:

25 bbl. of flour,	@	\$ 5.25
20 bbl. of sugar,	@	14.50
29 hams,	@	1.85
112 lb. of bacon,	@	0.10

Find total, and receipt the bill, acting as clerk for T. C. Jenkins & Co. yourself.

61. How many pecks are there in $17\frac{1}{2}$ bushels?

62. $(.5 + .75) \div .00125 = ?$

63. In an orchard there are 144 trees; 18 are cherry, 36 are apple, and $\frac{4}{5}$ of the remainder are peach trees. How many are peach trees?

64. How many pecks are there in 25 bu. 3 pk.?

65. Find the cost of $21\frac{3}{4}$ bushels wheat at 80¢ a bushel.

66. 1 ton of coal will cost how many times as much as 5 hundredweight? as 600 pounds? as 60 pounds?

67. A haystack contains 9000 pounds of hay. How much is it worth at \$15 a ton?

68. A grocer bought 5 barrels of cider at \$6.50 a barrel, and sold it at \$0.10 a quart. How much did he gain?

69. A farmer exchanged 45 pounds of butter, at 30 cents a pound, for sugar, at 5 cents a pound. How many pounds of sugar did he receive?

70. How many cubic feet of air are there in a room 12 ft. long, $10\frac{1}{2}$ ft. wide, and 9 ft. high?

71. What is the cost of 48 gal. oil at 5 cents a quart?

72. For \$ $20\frac{1}{4}$, how many barrels, at \$ $2\frac{1}{4}$ a barrel, can be bought?

73. A boy lost $\frac{1}{4}$ of his marbles one day, $\frac{1}{5}$ of them the next day, and had 44 marbles left. How many had he at first?

74. John had 120 marbles. He gave Louis $\frac{3}{5}$ of them, and Henry $\frac{1}{3}$ of the remainder. How many had he remaining?

75. If a boy pays \$2.50 a hundred for papers, and sells them for 5 cents apiece, how much does he gain on 300 papers?

76. A field contains 25 rows of corn. If each row yields 5 bu. 3 pk., how much corn will the field yield?

77. What will be the cost of painting the ceiling and the floor of a kitchen 14 ft. long and 12 ft. wide, at \$0.10 per square yard?

78. Mary has \$175. How much will it amount to in 3 years and 10 months at 6 %?

79. How many loads of earth will be removed in excavating a cellar 24 ft. long, 18 ft. wide, and 6 ft. deep?

80. Add one and one tenth, one and one thousandth, one hundred and one thousandth, ten and five hundredths, and six tenths.

81. Frank worked $2\frac{1}{2}$ hours for five days each week and 12 hours each Saturday. Find his earnings for 10 weeks at 12¢ an hour.

ANSWERS

THIRD YEAR

Page 32.—2. *a.* 994; *b.* 820; *c.* 781; *d.* 1204; *e.* 831; *f.* 755 **3.** *a.* 1005; *b.* 853; *c.* 1733; *d.* 1442; *e.* 1490; *f.* 1932. **4.** *a.* 968; *b.* 962; *c.* 954; *d.* 1334; *e.* 189; *f.* 757. **5.** *a.* 1397; *b.* 1006; *c.* 1338; *d.* 1292; *e.* 1414; *f.* 1757.

Page 33.—1. *a.* 38; *b.* 44; *c.* 34; *d.* 32; *e.* 30; *f.* 38; *g.* 41; *h.* 41; *i.* 42; *j.* 32; *k.* 45; *l.* 46; *m.* 34; *n* 32. **2.** *a.* 784; *b.* 1118; *c.* 2040; *d.* 1196; *e.* 553; *f.* 1235; *g.* 561. **3.** *a.* 2050; *b.* 1397; *c.* 1433; *d.* 1609; *e.* 1569; *f.* 1695; *g.* 994. **4.** *a.* 1411; *b.* 2020; *c.* 1325; *d.* 838; *e.* 1654; *f.* 706; *g.* 1037.

Page 34.—2. *a.* 3695; *b.* 3494; *c.* 7421; *d.* 1763; *e.* 10,388. **3.** *a.* 7783; *b.* 5778; *c.* 10,805; *d.* 14,553; *e.* 11,997. **4.** *a.* 12,640; *b.* 13,239; *c.* 9715; *d.* 5610; *e.* 12,803. **5.** 27. **6.** 26. **7.** 33. **8.** 35.

Page 35.—1. 600. **2.** 1044. **3.** 4631. **4.** 3004. **5.** 1305. **6.** 800. **7.** 834. **8.** 1175 ¢. **9.** $654. **10.** 187 pt. **11.** 1159 qt. **12.** 1109 pk. **13.** 1330 in. **14.** 4364 dimes. **15.** 5627 hr. **16.** 2239 min. **17.** 3153 gal. **18.** 3882 da.

Page 36.—1. 22,595. **2.** 19,999. **3.** 14,177. **4.** 19,265. **5.** 15,189. **6.** 24,973. **7.** 22,537. **8.** 23,289. **9.** 23,320. **10.** 15,873. **11.** 36 men. **12.** $676. **13.** 774 mi. **14.** 787 bu. **15.** $678.

Page 41.—5. 87 boys. **6.** 27 chickens. **7.** 209 mi. **8.** 7 ft. **9.** 167 mi.

Page 42.—1. 3749 pupils. **2.** $625. **3.** 3712 ft. **4.** 4385 people. **5.** 1511 boys. **6.** 5437 flags. **7.** 430 steps. **8.** 390 fares.

Page 54.—2. $6.06; $5.60; $4.49; $6.07; $5.68. **3.** $22.35. **4.** $23.54. **5.** $24.73. 1st col.: $9.62; 2d col.: $10.92; 3d col.: $11.87; 4th col.: $13.93; 5th col.: $8.24; 6th col.: $16.04. **6.** *a.* $2.21; *b.* $.51; *c.* $.85; *d.* $3.46; *e.* $2.48. **7.** *a.* $.96; *b.* $1.79; *c.* $1.25; *d.* $.85; *e.* $2.57. **8.** $6.89. **9.** $5.78. **10.** $3.90. **11.** $4.82.

Page 55.—1. *a.* $913.87; *b.* $2489.87; *c.* $2269.27; *d.* $2624.92. **2.** *a.* $1444.03; *b.* $1521.75; *c.* $1347.07; *d.* $902.09. **3.** $1671.24. **4.** $873.44. **5.** $1292.77. **6.** $835.82. 1st col.: $1412.07; 2d col.: $172.80; 3d col.: $1244.99; 4th col.: $1843.41. Total, $4673.27. **7.** *a.* $279.08; *b.* $256.29; *c.* $242.91; *d.* $626.04. **8.** *a.* $97.77; *b.* $28.39; *c.* $167.51; *d.* $138.60. **9.** $71.62. **10.** $65.82.

Page 63.—1. *a.* 16,910; *b.* 20,524; *c.* 19,634; *d.* 18,184; *e.* 13,022. **2.** *a.* 18,330; *b.* 15,900; *c.* 16,996; *d.* 22,750; *e.* 21,607. **3.** *a.* 21,010; *b.* 24,150; *c.* 24,153; *d.* 26,261; *e.* 26,350.

Page 64.—2. *a.* 3136; *b.* 5591; *c.* 3239; *d.* 1812; *e.* 2541. **3.** *a.* 1084; *b.* 2293; *c.* 4986; *d.* 1766; *e.* 3844. **4.** *a.* 3939; *b.* 2814; *c.* 1285; *d.* 1832; *e.* 4809. **5.** *a.* 3226; *b.* 1778; *c.* 1343; *d.* 2244; *e.* 950. **6.** *a.* 3058; *b.* 206; *c.* 2429; *d.* 2291; *e.* 2215. **7.** 6908; 6921.

Page 65.—**1.** *a.* 1869; *b.* 819; *c.* 2639; *d.* 3479; *e.* 659. **2.** *a.* 1706; *b.* 1599; *c.* 1888; *d.* 494; *e.* 468. **3.** *a.* 2059; *b.* 1505; *c.* 3699; *d.* 948; *e.* 955. **4.** *a.* 3579; *b.* 4065; *c.* 489; *d.* 995; *e.* 2764. **5.** *a.* 749; *b.* 947; *c.* 2105; *d.* 3805; *e.* 3736. **6.** *a.* 3676; *b.* 487; *c.* 4405; *d.* 4006; *e.* 4798. **7.** *a.* 4098; *b.* 769; *c.* 526; *d.* 2069; *e.* 1854. **8.** *a.* 3657; *b.* 999; *c.* 604; *d.* 892; *e.* 3775.

Page 73.—**1.** *a.* $1447.28; *b.* $984.34; *c.* $1180.93; *d.* $1572.63. **2.** *a.* $154.56; *b.* $97.75; *c.* $76.78; *d.* $140.21. **3.** $9737.98. **4.** $1098.36. **5.** $982.04. **6.** *a.* $57.18; *b.* $145.71; *c.* $174.67; *d.* $90.51; *e.* $216.72. **7.** *a.* $356.59; *b.* $93.58; *c.* $37.98; *d.* $733.47; *e.* $90. **8.** $190.35. **9.** $250.78. **10.** $272.27. **11.** $261.62. **12.** $119.37. **13.** $89.91.

Page 74.—**4.** $4\frac{1}{2}$ gal. **5.** 7 bu. **6.** 10 yd. **7.** 4 qt. **9.** $35\frac{1}{2}$. **10.** $55\frac{1}{2}$. **11.** $79\frac{1}{2}$. **12.** 133. **13.** 6; 8; 1; 4; 9; $9\frac{1}{2}$. **14.** $3\frac{1}{2}$; $1\frac{1}{2}$; 2; 2; 7; 8. **15.** 17; 8; 7; 13; $25\frac{1}{2}$; 23.

Page 75.—**3.** *a.* 7; *b.* 8; *c.* $9\frac{1}{3}$; *d.* $13\frac{2}{3}$; *e.* 17. **4.** *a.* 31; *b.* 23; *c.* 23; *d.* 22; *e.* 30. **5.** 3; $5\frac{1}{3}$; $5\frac{2}{3}$; $3\frac{1}{3}$; 3. **6.** $4\frac{2}{3}$; $3\frac{1}{3}$; 5; 13; 8. **7.** 3 inches.

Page 76.—**2.** $3. **3.** $6\frac{1}{2}$. **4.** 7 gal. **5.** $5\frac{3}{4}$ pk. **6.** 9 bu. **7.** 9 hr. **8.** *a.* 11; *b.* 23; *c.* $36\frac{3}{4}$; *d.* $20\frac{3}{4}$; *e.* 27; *f.* 30. **9.** *a.* $52\frac{1}{2}$; *b.* 57; *c.* 90; *d.* 2; *e.* 29; *f.* 60. **10.** $5\frac{1}{2}$. **11.** 2. **12.** 5. **13.** 4. **14.** 7. **15.** $6\frac{1}{4}$. **16.** $1\frac{1}{4}$. **17.** $11\frac{1}{2}$. **18.** 16. **19.** $1\frac{1}{2}$. **20.** 9. **21.** 1. **22.** $12\frac{1}{2}$. **23.** $8\frac{1}{4}$. **24.** $7\frac{1}{2}$.

Page 77.—**1.** 6 tons. **2.** $6\frac{1}{2}$ gallons. **3.** $1625\frac{1}{2}$ gallons. **4.** 59 bu. **5.** $2\frac{1}{2}$ bu. **6.** 11 yards. **7.** 8 yards. **8.** $288. **9.** 92 lb. **10.** $1\frac{1}{2}$ gal. **11.** 69 ft.

Page 81.—**1.** 120 feet. **2.** $20. **3.** $26. **4.** $156. **5.** 41. **6.** $36. **7.** $400. **8.** $22.24.

Page 84.—**2.** 60. **3.** 84. **4.** 408. **5.** 714. **6.** 390. **7.** 990. **8.** 2464. **9.** 1023. **10.** 2576. **11.** 2322. **12.** 1476. **13.** 1728. **14.** 2223. **15.** 1591. **16.** 6045. **17.** 2530. **18.** 2009. **19.** 3776. **20.** $1.02. **21.** $5. **22.** $9.90. **23.** $1.20. **24.** $1.50. **25.** $3.51. **26.** $2.03. **27.** $2.70. **28.** $1.68. **29.** $2.64. **30.** $1.04. **31.** $2.90. **32.** 50¢. **33.** $2.55.

Page 89.—**1.** 28 yd. **2.** $2.24. **3.** 19 caps. **4.** 30 pupils. **5.** $1.26. **6.** $5.74. **7.** $4.45.

Page 91.—**1.** *a.* $75.06; *b.* $87.08; *c.* $66.01; *d.* $75.26; *e.* $52.03. **2.** *a.* Mon. $163.61; *b.* Tues. $181.53; *c.* Wed. $156.05; *d.* Thurs. $241.92; *e.* Fri. $255.09. Total, $998.20. Corn: $323.45; oats: $128.76; bran: $35.95; chop: $69.89; meal: $46.40; flour: $393.75. **3.** $3595.55. **4.** $11.55.

Page 92.—**3.** *a.* 2987; *b.* 2695; *c.* 1197; *d.* 991; *e.* 172. **4.** *a.* 6503; *b.* 240; *c.* 1791; *d.* 5098; *e.* 1363. **5.** *a.* 1100; *b.* 3631; *c.* 3619; *d.* 1414; *e.* 203. **6.** *a.* 3695; *b.* 1070; *c.* 1192; *d.* 2504; *e.* 4893. **7.** *a.* 2097; *b.* 2802; *c.* 295; *d.* 1308; *e.* 1503.

Page 93. — **28.** *a.* 18,868; *b.* 21,710; *c.* 32,740; *d.* 27,171; *e.* 27,189. **29.** *a.* 20,327; *b.* 26,902; *c.* 34,134; *d.* 30,398; *e.* 24,095.

Page 94. — **1.** 104 feet. **2.** $38.50. **3.** $4.05. **4.** 320 minutes. **5.** $5.25. **6.** $32.25.

Page 95. — **28.** 2143. **29.** 6639. **30.** 3332. **31.** 1553. **32.** 1002. **33.** 6168. **34.** 5770. **35.** 2522. **36.** 2226. **37.** 917. **38.** 2042. **39.** 2660. **40.** 4791. **41.** 4414. **42.** 4563. **43.** 1494. **44.** 3357. **45.** 1963. **46.** 4207. **47.** 1055. **48.** 3042. **49.** 3523. **50.** 3274. **51.** 741. **52.** 4534. **53.** 2120. **54.** 3809.

Page 97. — **7.** 40¢. **8.** $24. **9.** $12. **10.** 30¢. **12.** $960. **13.** $30. **14.** $195. **15.** $9. **16.** $255.

Page 102. — **1.** $20. **2.** $1.26. **3.** $2.75. **4.** $2.24. **5.** $15.75. **6.** $48.60. **7.** $2. **8.** $6.80. **9.** $15.75. **10.** $16.87½. **11.** $1.96. **12.** $14.25. **13.** $12. **14.** $9.96. **15.** $114.50. **16.** $3.74.

Page 103. — **1.** 288 pints. **2.** 234 miles. **3.** $2.64. **4.** 3 hours. **5.** 55¢. **6.** 23 pounds. **7.** 21 plants. **8.** 34 weeks. **9.** 340 sheep. **10.** $2.16. **11.** 99 bushels. **12.** 99 gallons. **13.** 131 tons. **14.** 32 quarts, or 8 gallons.

Page 104. — **15.** 209 boxes. **16.** $125. **17.** 41 weeks. **18.** 38 days. **19.** 13 cents. **20.** 18 yards. **21.** 6 cents. **22.** $2.25. **23.** $24. **24.** $63. **25.** 56¢. **26.** $16. **27.** $1. **28.** $21. **29.** $31.50. **30.** 96¢. **31.** $27. **32.** 60¢. **33.** $4. **34.** 80¢. **35.** $20. **36.** $1200.

Page 105. — **37.** 7 hours. **38.** 1152 sq. in. **39.** $52.50. **40.** 99¢. **41.** $38. **42.** $15.75. **43.** $124. **44.** 114 palings. **45.** $1.36. **46.** $9.60. **47.** $2. **48.** $286. **49.** $2700.

Page 106. — **50.** $2.45. **51.** $1275. **52.** 1008 pounds. **53.** $38.25. **54.** $4.25. **55.** 288 pupils. **56.** $270. **57.** $4.08. **58.** $17.50. **59.** 32¢; 48¢. **60.** $17.76.

FOURTH YEAR

Page 108. — **1.** 42,000. **2.** 66,004. **3.** 75,050. **4.** 39,122. **5.** 210,350. **6.** 565,100. **7.** 1,125,000. **8.** 3,600,035. **9.** 25,009,026. **10.** 80,026,064. **11.** 900,009. **12.** 46,004,016. **13.** 110,000,500. **14.** 336,000,104. **15.** 507,005,006. **16.** 17,003,075. **17.** 1,002,704. **18.** 1,104,185. **19.** 21,110,109. **20.** 604,622,468. **21.** 101,010,010.

Page 109. — **4.** $1050.27. **5.** $904.60. **6.** *a.* $108.08; *b.* $228.47; *c.* $121.79; *d.* $463.51. **7.** *a.* $602.92; *b.* $765.69; *c.* $437.07; *d.* $622.92.

Page 110. — **2.** 846 bu. **3.** $103. **4.** 184 da. **5.** $16,995. **6.** $6572. **7.** 108 ft. **8.** 444 mi. **9.** $66.91.

Page 111. — **2.** 56 yr. in 1907. **3.** $10,905. **4.** 8847 votes. **5.** $4234 **6.** 8224 bu. **7.** 6199. **8.** $739. **9.** 196 lb. **10.** 2669 votes.

Page 114. — **3.** First col. 5580; 5115. 6552; 6006. 9408; 8624. 9420; 8635. 11,736; 10,758. Second col. 2832; 2596. 9396; 8613. 11,244; 10,307. 6168; 5654. 8328; 7634. Third col. 9468; 8679. 11,136; 10,208. 8316; 7623. 11,256; 10,318. 3552; 3256.
2. 408. **3.** 672. **4.** 990. **5.** 1140. **6.** 609. **7.** 1331. **8.** 2800.

Page 116. — **4.** 248, rem. 10. **5.** 754. **6.** 185, rem. 1. **7.** 632, rem. 2. **8.** 362, rem. 4. **9.** 273, rem. 4. **10.** 811, rem. 2. **11.** 196, rem. 2. **12.** 732, rem. 5. **13.** 6341, rem. 2. **14.** 6642, rem. 3. **15.** 8188, rem. 6. **19.** 306, rem. 6. **20.** 344, rem. 7. **21.** 581, rem. 1. **22.** 594. **23.** 391, rem. 1. **24.** 651, rem. 5. **25.** 244, rem. 8. **26.** 769, rem. 10. **27.** 391, rem. 5. **28.** 782. **29.** 3516. **30.** 5781, rem. 6. **31.** 6162, rem. 1. **32.** 6888, rem. 3. **33.** 3108. **34.** 7656, rem. 3. **35.** 2060, rem. 6. **36.** 5696, rem. 7. **37.** 6813, rem. 7. **38.** 7697.

Page 117. — **1.** $27. **2.** $420. **3.** $36.50. **4.** $15. **5.** $255. **6.** $15.75. **7.** $7.50. **8.** $23.90. **9.** $950. **10.** $24.75. **11.** $52.25. **12.** $52.50. **13.** $4.50. **14.** $54. **15.** $4.25. **16.** $8.12. **17.** $1.95. **18.** $4.50. **19.** $3.25. **20.** $7.20. **21.** $4.85. **22.** $3. **23.** $2.25. **24.** $.12. **25.** $3.25. **26.** $1.25. **27.** $3.09. **28.** $.25. **29.** $.15. **30.** $3.55. **31.** $.04. **32.** $.18. **33.** $.12. **34.** $.75. **35.** $.25. **36.** $3.50. **37.** $.22. **38.** $.20. **39.** $3.75. **40.** $1.75. **41.** $.11. **42.** $.20. **43.** $3.25. **44.** $.20.

Page 118. — **1.** 54 mi. **2.** $33.25. **3.** 96 times. **4.** $482. **5.** 110 lb. **6.** $7.20. **7.** $3.70. **8.** $1427. **9.** 410 boys.

Page 119. — **1.** *a.* $32,538.46; *b.* $28,736.50; *c.* $30,165.56. **2.** *a.* $21,464.87; *b.* $24,836.37; *c.* $20,168.03. **3.** *a.* $20,184.93; *b.* $21,878.20; *c.* $24,181.02.

Page 120. — **1.** *a.* $681.83; *b.* $748.19; *c.* $614.95; *d.* $681.68. **2.** *a.* $286.42; *b.* $159.45; *c.* $800.99; *d.* $511.68. **3.** *a.* $304.49; *b.* $713.35; *c.* $195.01; *d.* $366.44. **4.** *a.* $784.66; *b.* $812.60; *c.* $32.45; *d.* $233.45. **5.** *a.* $412.34; *b.* $444.45; *c.* $511.70; *d.* $2.32. **6.** *a.* $511.78; *b.* $256.77; *c.* $730.87; *d.* $653.09. **7.** *a.* $642.19; *b.* $775.47; *c.* $732.60; *d.* $137.96. **8.** *a.* $364.93; *b.* $176.05; *c.* $386.08; *d.* $453.11.

Page 123. — **9.** 14,200. **10.** 255,000. **11.** 980,000. **12.** 500,500. **13.** 6940. **14.** 12,270. **15.** 42,900. **16.** 26,320. **17.** 42,750. **18.** 146,500. **19.** 550,200. **20.** 73,600. **21.** 477,600. **22.** 166,400. **23.** 962,000. **24.** 3,576,000. **25.** 6,342,000. **26.** 6,552,000. **27.** 438,000.

Page 125. — **2.** 4. **3.** 2. **4.** 9. **5.** 2. **6.** 9. **7.** 10. **8.** 30. **9.** 21 **10.** 12. **11.** 6. **12.** 6. **13.** 4. **14.** 20 cans. **15** 50 packages. **16.** 5 lb. **17.** 120 coats. **18.** 35 mo.

Page 126. — **6.** *a.* 1512; *b.* 20,640; *c.* 20,712; *d.* 26,775; *e.* 34,658. **7.** *a.* 2254; *b.* 18,684; *c.* 9135; *d.* 39,483; *e.* 44,013. **8.** *a.* 25,972. *b.* 27,552; *c.* 39,015; *d.* 41,202; *e.* 31,212.

Page 127. — **1.** 9798. **2.** 15,252. **3.** 8448. **4.** 9824. **5.** 11,567. **6.** 8289. **7.** 19,368. **8.** 46,368. **9.** 25,324. **10.** 34,790. **11.** 23,458.

12. 21,754 **13.** 28,992. **14.** 29,160. **15.** 77,658 **16.** 54,826 **17.** 82,592. **18.** 54,450. **19.** 9772. **20.** 10,122. **21** 432,288 **22.** 202,050. **23.** 304,076. **24.** 287,631. **25.** 355,992. **26.** 207,718. **27.** 352,408. **28.** 52,780. **29.** 73,818. **30.** 133,408. **33.** 33,799. **34.** 78,792. **35.** 66,215. **36.** 85,728. **37.** 828,996. **38.** 304,854. **39.** 441,441. **40.** 449,550. **41.** 243,404. **42.** 361,959 **43.** 346,625. **44.** 227,864.

Page 128. — **5.** $175. **6.** $957. **7.** $4085. **8.** $17.82. **9.** $27.60. **10.** 654 pt. **11.** 10,140 in. **12.** 656 pk. **13.** 6000 oz.

Page 129. — **1.** $4.20. **2.** $11.16. **3.** $11.76. **4.** $13.05. **5.** $10.32. **6.** $29.75. **7.** $12.96. **8.** $34.95. **9.** $5.75. **10.** $283.50. **11.** $63.45 **12.** $229.50. **13.** $83.16. **14.** $37.44. **15.** $41.76. **16.** $609.55 **17.** $11,440. **18.** $241.92. **19.** 226 hr.

Page 130 — **5.** $1. **6.** $.90. **7.** $270. **8.** $2.80. **9.** $12. **10.** $.32. **11.** $455. **12.** $324.

Page 132. — **6.** 21; 32; 43.

Page 133. — **1.** 12. **2.** 25. **3.** 41. **4.** 34. **5.** 31. **6.** 17. **7.** 24. **8.** 114, rem. 4. **9.** 125. **10.** 23. **11.** 29. **12.** 217. **13.** 203. **14.** 307. **15.** 403. **16.** 119, rem. 30. **17.** 32. **18.** 207. **19.** 62. **20.** 71. **21.** 33.

Page 134. — **1.** 42. **2.** 43. **3.** 24. **4.** 39. **5.** 15. **6.** 27. **7.** 19. **8.** 21. **9.** 37. **10.** 29. **11.** 16. **12.** 30. **13.** 25. **14.** 32. **15.** 42. **16.** 6. **17.** 25. **18.** 24. **19.** 29. **20.** 7. **21.** 21. **22.** 29. **23.** 5. **24.** 6. **25.** 14. **26.** 26. **27.** 17. **28.** 19. **29.** 23. **30.** 56. **31.** 27. **32.** 35. **33.** 24. **34.** 38. **35.** 40. **36.** 41. **37.** 31. **38.** 160. **39.** 220. **40.** 32. **41.** 33. **42.** 72. **43.** 64. **44.** 28. **45.** 29. **46.** 44. **47.** 45. **48.** 36. **49.** $36. **50.** 52 da. **51.** 16 oz. **52.** $1.85. **53.** 895 bu. **54.** 9 hr. **55.** 8 words.

Page 135. — **2.** 47. **3.** 45, rem. 18. **4.** 62. **5.** 77, rem. 19. **6.** 63. **7.** 67, rem. 18. **8.** 83, rem. 19. **9.** 77, rem. 19. **10.** 53, rem. 61. **11.** 62. **12.** 41. **13.** 61. **14.** 63, rem. 2. **15.** 65, rem. 44. **16.** 77. **17.** 44, rem. 56. **18.** 59, rem. 60. **19.** 47. **20.** 76, rem. 6. **21.** 86, rem. 2. **22.** 83, rem. 23. **23.** 24, rem. 55. **24.** 73, rem 76. **25.** 183, rem. 22. **26.** 310, rem. 17. **27.** 109, rem. 5. **28.** 50, rem. 32. **29.** 52, rem. 30. **30.** 94, rem. 84. **31.** 106, rem. 55. **32** 318, rem. 21. **33.** 123, rem. 15. **34.** 92, rem. 86. **35.** 34 suits; $7 left. **36.** 8 bbl.

Page 136. — **2.** 30 belts. **3.** 13 lb. **4.** 163 gal. **5.** 18 yd. **6.** 35 mo.; 2 11/12 yr. **7.** 325 bars. **8.** 160 A. **9.** 126 trees. **10.** $74.

Page 137. — **11.** 39 bu. **12.** $104. **13.** 28 mi.

Page 138. — **1.** $3.37½. **2.** $528. **3.** $64. **4.** $16. **5.** $477. **6.** $36. **7.** $149.64. **8.** $500. **9.** $2080. **10.** $83.25. **11.** $36.40. **12.** $7.20. **13.** $1024. **14.** $1843.75. **15** $378. **16.** $10.50. **17.** $67.86. **18.** $19. **19.** $12.50. **20.** $6.25. **21.** $30. **22.** $6.57. **23.** $12. **24.** $4723.71. **25.** $18,889.06. **26.** $22,479.55. **27.** $11,376.97.

Page 139.—**1.** $5.25. **2.** $4.95. **3.** $3. **4.** $10. **5.** $6.25. **6.** $3. **7.** $3.60. **8** $55. **9.** $145. **10.** $1.90. **11.** $5.25. **12.** $9.60. **13.** $9. **14.** $18. **15.** $8. **16.** $21. **17.** $32. **18.** $22. **19.** $34. **20.** $16. **21.** $12. **22.** $19. **23.** 44 mi. **24.** $.29.

Page 140.—**1.** 7 cows. **2.** $980. **3.** 56 A; $1988. **4.** $2587.20. **5.** $98. **6.** $242.50. **7.** $540. **8.** $7. **9.** $435. **10.** $532.50. **11.** $22.50.

Page 141.—**5.** 180 sec. **6.** 144 hr. **7.** 420 min. **8.** 78 hr. **9.** 76 da. **10.** 91 da.; 92 da.

Page 142.—**4.** 6 T. + 1500 lb. **5.** $.48. **6.** $33. **7.** 4000 packages. **8.** 32,000 oz. **9.** 1½ T.; $21.

Page 144.—**1.** 20 yd. **2.** 445½ ft. **3.** 192 in. **4.** 3½ ft. **5.** 5280 ft. **6.** 5280 ft. **7.** 60 in. **8.** 10 ft. **9.** 24 yd **10.** 35 ft. **11.** 3750 ft. **12.** 1980 ft. **13.** 228 ft. **14.** 5940 rd. **15.** 810 yd.; 2850 ft.

Page 146.—**1.** 24 sq. in. **2.** 49 sq. in. **3.** 40 sq. in. **4.** 120 sq. in. **5.** 64 sq. in. **6.** 144 sq. in. **7.** 81 sq. in. **8.** 100 sq. in. **9.** 15 sq. in.; 16 in. **10.** 20 in.; 28 in.; 26 in.; 44 in.; 32 in.; 48 in.; 36 in.; 40 in. **11.** 36 sq. ft.; 24 ft. **12.** 36 sq. ft.; 26 ft. **13.** 54 sq. ft.; 30 ft. **14.** 30 sq. ft.; 22 ft. **15.** 80 sq. yd.; 36 yd. **16.** 45 sq. yd.; 36 yd. **17.** 24 sq. yd.; 28 yd. **18.** 20 sq. yd.; 18 yd.

Page 147.—**11.** 6606. **12.** 2,010,000,004. **13.** 75,906. **14.** 1,008,000,075. **15.** 84,605,000. **16.** 25,038. **17.** 900,000,999. **18.** 2,006,030. **19.** 1,001,001,000.

Page 148.—**3.** 155. **4.** 190. **5.** 195. **6.** 162. **7.** 196; *a.* 192; *b.* 384; *c.* 322. Total, 898. **8.** 121. **9.** 217. **10.** 152. **11.** 189. **12.** 162. *d.* 248; *e.* 248; *f.* 345. Total, 841. **13.** $186.67. **14.** $60.13. **15.** $94.87. **16.** $128.80. **17.** $163.36. *a.* $184.08; *b.* $202.51; *c.* $71.83; *d.* $175.41. Total, $633.83. **18.** $480.01. **19.** $520.98. **20.** $989.32. **21.** $1160.15. **22.** $1036.75. *a.* $342.86; *b.* $319.88; *c.* $227.50; *d.* $3296.97. Total, $4187.21. **23.** 54,938.

Page 149.—**1.** $29,507.28. **2.** $4644.85. **3.** $3660.64. **4.** $658,373.86. **5.** $21,684.52.

Page 150.—**1.** *a.* $3569.11; *b.* $1980.73; *c.* $3351.74; *d.* $1801.11. **2.** *a.* $2578.31; *b.* $4340.01; *c.* $5037.33; *d.* $4154.59. **3.** *a.* $3490.40; *b.* $13,565.92; *c.* $3355.63; *d.* $15,631.90.

Page 151.—**1.** *a.* $211.70; *b.* $128.45; *c.* $33,812.37; *d.* $1979.02. **2.** *a.* $310.20; *b.* $227.74; *c.* $15,577.79; *d.* $724.73. **3.** *a.* $923.68; *b.* $596.88; *c.* $17,950.52; *d.* $8694.69. **4.** *a.* $387.06; *b.* $218.02. *c.* $17,619.20; *d.* $2563.59. **5.** *a.* $46.06; *b.* $23.08; *c.* $148.92; *d.* $7986.86. **6.** *a.* $63; *b.* $51.94; *c.* $129.37; *d.* $5873.83. **7.** *a.* $54.85; *b.* $52.05; *c.* $463.54; *d.* $57,529.24. **8.** *a.* $8.03; *b.* $23.52; *c.* $241.08; *d.* $17,879.01. **9.** *a.* $52.83; *b.* $72.20; *c.* $61.44; *d.* $14,140.29.

Page 152. —
1. *a.* 186,230; *b.* 380,925; *c.* 423,250; *d.* 727,990; *e.* 643,340;
f. 829,570; *g.* 474,040; *h.* 584,085; *i.* 821,105; *j.* 753,385.
2. *a.* 168,190; *b.* 344,025; *c.* 382,250; *d.* 657,470; *e.* 581,020;
f. 749,210; *g.* 428,120; *h.* 527,505; *i.* 741,565; *j.* 680,405.
3. *a.* 192,302; *b.* 393,345; *c.* 437,050; *d.* 751,726; *e.* 664,316;
f. 856,618; *g.* 489,496; *h.* 603,129; *i.* 847,877; *j.* 777,949.
4. *a.* 216,920; *b.* 443,700; *c.* 493,000; *d.* 847,960; *e.* 749,360;
f. 966,280; *g.* 552,160; *h.* 680,340; *i.* 956,420; *j.* 877,540.
5. *a.* 185,350; *b.* 379,125; *c.* 421,250; *d.* 724,550; *e.* 640,300,
f. 825,650; *g.* 471,800; *h.* 581,325; *i.* 817,225; *j.* 749,825.
6. *a.* 212,388; *b.* 434,430; *c.* 482,700; *d.* 830,244; *e.* 733,704;
f. 946,092; *g.* 540,624; *h.* 666,126; *i.* 936,438; *j.* 859,206.
7. *a.* 173,118; *b.* 354,105; *c.* 393,450; *d.* 676,734; *e.* 598,044;
f. 771,162; *g.* 440,664; *h.* 542,961; *i.* 763,293; *j.* 700,341.
8. *a.* 214,830; *b.* 439,425; *c.* 488,250; *d.* 839,790; *e.* 742,140;
f. 956,970; *g.* 546,840; *h.* 673,785; *i.* 947,205; *j.* 869,085.
9. *a.* 107,250; *b.* 219,375; *c.* 243,750; *d.* 419,250; *e.* 370,500;
f. 477,750; *g.* 273,000; *h.* 336,375; *i.* 472,875; *j.* 433,875.
10. *a.* 185,240; *b.* 378,900; *c.* 421,000; *d.* 724.120; *e.* 639,920;
f. 825,160; *g.* 471,520; *h.* 580,980; *i.* 816,740; *j.* 749,380.
13. *a.* 985, rem. 55; *b.* 1086, rem. 57; *c.* 931, rem. 44; *d.* 1436, rem. 41;
e. 1177, rem. 21; *f.* 1265, rem. 10; *g.* 1033, rem. 59; *h.* 1304, rem. 5.
14. *a.* 670, rem. 52; *b.* 739, rem. 30; *c.* 633, rem. 69; *d.* 977, rem. 29;
e. 801; *f.* 860, rem. 52; *g.* 703, rem. 26; *h.* 887, rem. 17.
15 *a.* 938, rem. 52; *b.* 1034, rem. 68; *c.* 887, rem. 3; *d.* 1368, rem. 8;
e. 1121, rem. 8; *f.* 1204, rem. 52; *g* 984, rem. 32; *h.* 1241, rem. 55.
16. *a.* 589, rem. 70; *b.* 650, rem. 24; *c.* 557, rem. 37; *d.* 859, rem. 43;
e. 704, rem. 36; *f.* 757, rem. 5; *g.* 618, rem. 48; *h.* 780, rem. 24.
17. *a.* 708, rem. 37; *b.* 781, rem. 7; *c.* 669, rem. 46; *d.* 1032, rem. 37;
e. 846, rem. 13; *f.* 909, rem. 22; *g.* 742, rem. 81; *h.* 937, rem. 20.
18. *a.* 1004, rem. 68; *b.* 1107, rem. 66; *c.* 949, rem. 53; *d.* 1464, rem. 36;
e. 1200, rem. 12; *f.* 1289, rem. 49; *g.* 1053, rem. 66; *h.* 1329, rem. 27.
19. *a.* 888, rem. 44; *b.* 979, rem. 50; *c.* 839, rem. 63; *d.* 1295, rem. 7;
e. 1061, rem. 20; *f.* 1140, rem. 32; *g.* 931, rem. 70; *h.* 1175, rem. 37.
20. *a.* 970, rem. 36; *b.* 1069, rem. 74; *c.* 917, rem. 9; *d.* 1414, rem. 30;
e. 1159, rem. 8; *f.* 1245, rem. 41; *g.* 1017, rem. 62; *h.* 1283, rem. 61.

Page 153. — **3.** Sum $8\frac{3}{4}$; diff. $2\frac{1}{4}$. **4.** Sum $18\frac{1}{4}$; diff. $1\frac{1}{4}$. **5.** Sum 13; diff. 6. **6.** Sum $9\frac{1}{4}$; diff. $1\frac{1}{4}$. **7.** Sum $11\frac{1}{4}$; diff. $6\frac{1}{4}$. **9.** $79\frac{1}{4}$. **10.** $82\frac{1}{2}$. **11.** $43\frac{3}{4}$. **12.** 72.

Page 154. — **7.** $10\frac{7}{8}$. **8.** $25\frac{3}{4}$. **9.** 23. **10.** $26\frac{5}{8}$. **11.** $20\frac{7}{8}$. **13.** Diff. $5\frac{1}{8}$; sum $15\frac{3}{8}$. **14.** Diff. $6\frac{3}{8}$; sum $18\frac{5}{8}$. **15.** Diff. $19\frac{3}{8}$; sum $36\frac{1}{8}$. **16.** Diff. $13\frac{1}{8}$; sum $25\frac{3}{8}$. **17.** Diff. $20\frac{1}{8}$; sum $52\frac{7}{8}$. **18.** Diff. $31\frac{2}{8}$; sum 94. **19.** Diff. $24\frac{1}{4}$; sum $103\frac{1}{4}$. **20.** Diff. $2\frac{3}{8}$; sum $51\frac{1}{8}$. **21.** Diff. $9\frac{3}{8}$; sum $28\frac{1}{8}$. **22.** Diff. $20\frac{5}{8}$; sum $60\frac{7}{8}$.

Page 155. — **3.** Sum $25\frac{8}{9}$; diff. $5\frac{4}{9}$. **4.** Sum $42\frac{1}{2}$; diff. $16\frac{1}{6}$. **5.** Sum $101\frac{2}{3}$; diff. $61\frac{1}{3}$. **6.** Sum $56\frac{2}{9}$; diff. $29\frac{5}{9}$. **7.** Sum $74\frac{7}{8}$; diff. $50\frac{3}{8}$. **8.** Sum $28\frac{1}{2}$; diff. $3\frac{1}{6}$. **9.** Sum $27\frac{1}{8}$; diff. $6\frac{5}{8}$. **10.** Sum $31\frac{5}{6}$; diff. $7\frac{1}{2}$. **11.** $\frac{1}{2}$ doz. **12.** $2\frac{1}{6}$ hr. **13.** 14 ft. **14.** $2\frac{2}{9}$ hr.

Page 156. — **2.** 173,250. **3.** 68,769. **4.** 79,232. **5.** 143,352. **6.** $13,243.75. **7.** $9729.72. **8.** $35,131.86. **9.** $39,363.50. **10.** 152,055. **11.** 272,527. **12.** 436,792. **13.** 925,806. **14.** 374,274. **15.** 801,975. **16.** 228,717. **17.** 791,154. **18.** 787,788. **19.** 8,166,625. **20.** 5,101,995. **21.** 7,349,238. **22.** 5,626,836. **23.** 5,810,553. **24.** $12,856.25. **25.** $70,761.42. **26.** $74,017.80. **27.** $34,549.95. **28.** $47,792.88. **29.** $76,069.08. **30.** $32,388.10.

Page 157. — **5.** 158,632. **6.** 84,150. **7.** 173,340. **8.** 155,342. **9.** 74,844. **10.** 357,336. **11.** 127,072. **12.** 566,820. **13.** $4904.56. **14.** $24,572.25. **15.** $45,712.80. **16.** $26,742.12.

Page 158. — **1.** 2,179,584. **2.** 7,611,881. **3.** 4,457,880. **4.** 4,086,420. **5.** 2,264,192. **6.** 1,248,051. **7.** 6,356,256. **8.** 2,450,856. **9.** 4,569,706. **10.** 6,348,090. **11.** $32,682.10. **12.** $53,352.25. **13.** $20,693.28. **14.** $36,042.60. **15.** $39,147.42. **16.** 5,751,635. **17.** 420,104. **18.** 1,239,150. **19.** 2,359,875. **20.** 2,209,106. **21.** 2,989,472. **22.** 6,167,430. **23.** 3,675,846. **24.** 4,516,338. **25.** 6,308,816. **26.** 6,133,640. **27.** 5,381,360. **28.** 5,940,102. **29.** 6,161,427. **30.** 3,924,462. **31.** 6,236,576. **32.** 3,490,062. **33.** 2,982,640. **34.** 3,183,404. **35.** 2,556,048. **36.** 1,046,068. **37.** 4,606,036. **38.** 3,375,374. **39.** 5,407,454. **40.** 5,632,452. **41.** 3,387,215. **42.** 5,286,660. **43.** 7,001,232. **44.** 4,993,515. **45.** 3,901,590. **46.** 433,125 cakes. **47.** 770,350 articles. **48.** $430.50. **49.** $105,022.50.

Page 160. — **2.** 630. **3.** 1218. **4.** 4050. **5.** 22,454. **6.** 120,428. **7.** 202,460. **8.** 182,152½. **9.** 386,568. **10.** 2,131,272. **11.** 3,251,105. **12.** 7,567,812. **13.** 2,857,240. **14.** 1,690,990. **15.** 7,440,372. **16.** 9,414,090. **17.** 7,334,634. **18.** 2,912,529. **19.** 8,558,146. **20.** 9,819,096. **21.** 6,970,012. **22.** 5,229,098. **23.** 3,454,723. **24.** 4,793,325. **25.** 8,440,432. **26.** 5,175,802. **27.** 6,452,746. **28.** 4,515,420. **29.** 3,410,505. **30.** 2,527,020. **31.** 1,823,822. **32.** 4,715,126. **33.** 6,938,272. **34.** 4,816,177. **35.** 5,699,174.

Page 162. — **9.** *a.* 504, rem. 92; *b.* 346, rem. 75; *c.* 41. **10.** *a.* 230, rem. 133; *b.* 322; *c.* 199, rem. 90. **11.** *a.* 339, rem. 26; *b.* 256, rem. 95; *c.* 32, rem. 442. **12.** *a.* 75, rem. 236; *b.* 427, rem. 66; *c.* 201, rem. 350. **13.** *a.* 283, rem. 90; *b.* 302, rem. 247; *c.* 215, rem. 119. **14.** *a.* 382, rem. 103; *b.* 441, rem. 136; *c.* 208, rem. 220.

Page 163. — **2.** 446 sheep. **3.** $816.75. **4.** $8615.

Page 164. — **5.** $438.25. **6.** $909. **7.** $27,450. **8.** $10.91. **9.** $9.04. **10.** $15.47.

Page 165. — **12.** $6020. **13.** 8624⅔ gal. **14.** 86. **15.** 602.

Page 166. — **17.** $6.16. **18.** 525 mi. **19.** 36 da. **20.** $984. **21.** $2.62. **22.** $99. **23.** $348.

Page 167. — **25.** 74 A. **26.** 50 cows. **27.** 80 ft. **28.** 792. **29.** $21. **30.** 40 rings.

Page 168. — **32.** $.12¼. **33.** 50 da. **34.** $157.50. **35.** 60 da. **36.** $25.20. **37.** 10,976 lb. **38.** $14,700.

Page 169. — **39.** 26,208 lb. **40.** \$.25. **41.** 2736 bu. **42.** 72 books. **43.** \$94.40. **44.** \$67.50. **45.** \$399.60. **46.** \$114.40. **47.** \$3.72 **48.** \$813. **49.** \$32.

Page 170. — **50.** \$18.73. **51.** \$3.24. **52.** \$19.25. **53.** 39 da. **54.** \$984. **55.** \$26.46. **56.** 3280 mi. **57.** \$6500. **58.** \$726 **59.** \$300.

Page 171. — **1.** 377, rem. 115. **2.** 365, rem. 50. **3.** 198, rem. 24 **4.** 246, rem. 120. **5.** 209, rem. 279. **6.** 232, rem. 140. **7.** 222, rem. 365 **8.** 194, rem. 148. **9.** 112, rem. 550. **10.** 160, rem. 424. **11.** 100, rem 99. **12.** 78, rem. 635. **13.** 141, rem. 671. **14.** 113, rem. 330. **15.** 748, rem. 94. **16.** 96, rem. 383. **17.** 135, rem. 36. **18.** 122, rem. 640. **19.** 220, rem. 8. **20.** 130, rem. 39. **21.** 345, rem. 163. **22.** 113, rem. 498. **23.** 123, rem. 192. **24.** 113, rem. 183. **25.** 336, rem. 345. **26.** 518, rem. 272. **27.** 1001, rem. 136. **28.** 2107, rem. 412. **29.** 2155, rem. 97. **30.** 1429, rem. 516. **31.** 1704, rem. 103. **32.** 1390, rem. 59. **33.** 3551, rem. 145. **34.** 2743, rem. 302. **35.** 1987, rem. 277. **36.** 3191, rem. 144. **37.** 1005, rem. 120. **38.** 8798, rem. 56. **39.** 7415, rem. 12. **40.** 1385, rem. 165. **41.** 1242, rem. 33. **42.** 4936, rem. 60. **43.** 2583, rem. 15. **44.** 2588, rem. 84.

Page 172. — **1.** 6. **2.** 7. **3.** 9. **4.** 21. **5.** 55. **6.** 95. **7.** 100. **8.** 19.

Page 173. — **2.** 96¢. **3.** \$1.20. **4.** \$3.50. **5.** \$45. **6.** 42 mi. **8.** 20¢. **9.** \$3. **10.** \$3. **11.** \$41. **12.** 4¢.

Page 174. — **1.** 6 pencils. **2.** 8 yd. **3.** 9 qt. **5.** \$1.35. **6.** \$80 **8.** \$1.60. **9.** 60¢. **10.** \$4.80.

Page 175. — **10.** \$60. **11.** \$1.50. **12.** \$$2\frac{1}{2}$. **13.** \$.90. **14.** \$150. **15.** \$22.80; 15 yd.

Page 176. — **16.** \$2.25. **17.** \$1.60. **18.** 120 bu. **19.** \$216. **20.** \$987. **21.** \$99.75. **22.** \$120.96. **23.** \$230.88. **24.** \$486.08. **25.** \$113.52 **26.** \$103.68. **27.** \$145.26. **28.** \$346.64. **29.** \$588.90. **30.** \$1404. **31.** \$210.24. **32.** \$921.60. **33.** \$10.80. **34.** \$201.60. **35.** \$59.04.

Page 177. — **1.** \$1.70.

Page 178. — **2.** \$2.94. **3.** \$13.05. **4.** \$.90. **5.** \$1.92. **6.** \$32.25 **7.** \$23.50. **8.** \$1.64. **9.** \$1.90. **10.** \$64.

Page 180. — **1.** 2 gal. **2.** 96 pk. **3.** 432 sq. in. **4.** 51 ft. **5.** 1440 in. **6.** 800 oz. **7.** 12,000 lb. **8.** $18\frac{1}{2}$ bu. **9.** 11,250 ft. **10.** $\frac{1}{4}$ ft. **11.** 1920 rd. **12.** 120 yd. **13.** 405 ft. **14.** 774 sq. yd. **15.** 11 doz. + 11; 13 doz. + 9 16 doz. + 3. **16.** 1728 sq. in. **17.** 78 sq. ft. **18.** \$.20 profit per bu. **19.** 1008 sq. ft. in floor; 1008 sq. ft. in ceiling. **20.** 3600 ft. **21.** \$32.

Page 181. — **1.** \$16,800. **2.** \$9750. **3.** \$440. **4.** \$152. **5.** \$400.

Page 182. —

1. *a.* 256, rem. 50; *b.* 106, rem. 172; *c.* 37, rem. 537.
2. *a.* 1237, rem. 7; *b.* 98, rem. 179; *c.* 89, rem. 764.
3. *a.* 236, rem. 15; *b.* 109, rem. 423; *c.* 158, rem. 144.
4. *a.* 1523, rem. 6; *b.* 98, rem. 174; *c.* 46, rem. 684.
5. *a.* 355, rem. 71; *b.* 100, rem. 124; *c.* 99, rem. 454.
6. *a.* 979, rem. 13; *b.* 122, rem. 658; *c.* 63, rem. 415.
7. *a.* 1039, rem. 25; *b.* 221, rem. 4; *c.* 172, rem. 60.
8. *a.* 2120, rem. 22; *b.* 110, rem. 345; *c.* 24, rem. 48.
9. *a.* 2678, rem. 11; *b.* 18, rem. 768; *c.* 83, rem. 346.
10. *a.* 671; *b.* 165, rem. 387; *c.* 62, rem. 222.
11. *a.* 598, rem. 50; *b.* 188, rem. 346; *c.* 215, rem. 125.
12. *a.* 207, rem. 25; *b.* 109, rem. 202; *c.* 40, rem. 802.
13. *a.* 392, rem. 28; *b.* 79, rem. 546; *c.* 117, rem. 46.
14. *a.* 2008, rem. 9; *b.* 105, rem. 68; *c.* 252, rem. 220.
15. *a.* 957, rem. 6; *b.* 84, rem. 39; *c.* 57, rem. 241.
16. *a.* 1044, rem. 25; *b.* 36, rem. 46; *c.* 83, rem. 364.
17. *a.* 2089, rem. 30; *b.* 80, rem. 25; *c.* 113, rem. 331.
18. *a.* 757, rem. 46; *b.* 307, rem. 43; *c.* 68, rem. 591.
19. *a.* 1279, rem. 47; *b.* 267, rem. 53; *c.* 103, rem. 196.
20. *a.* 987, rem. 64; *b.* 58, rem. 174; *c.* 133, rem. 76.
21. *a.* 954, rem. 13; *b.* 42, rem. 388; *c.* 249, rem. 186.
22. *a.* 810, rem. 17; *b.* 77, rem. 237; *c.* 83, rem. 18.
23. *a.* 1234, rem. 40; *b.* 131, rem. 400; *c.* 154, rem. 307.

Page 183. — **24.** Children, 5240; $786; adults, 12,641; $3160.25; one-horse vehicles, 1388; $485.80; two-horse vehicles, 796, $398; total, $4830.05. **25.** Tues. $1083.20; Wed., $1326.40; Thurs., $1008.50; Fri., $1411.95. **26.** $4830.05; $4830.05. **27.** $12.50. **28.** $.36. **29.** $105. **30.** $.18. **31.** $4060. **32.** 61¼ lb. **33.** 770 girls, 462 boys.

Page 184. — **34.** 58 wk. **35.** $12.16. **36.** $36.85½. **37.** $2.31. **38.** $356. **39.** $1.50. **40.** $840. **41.** $.60. **42.** 36 ft.; 5184 sq. ft. **43.** $5.76.

Page 185. — **44.** 40 people. **45.** 210 rd. **46.** 30 sq. yd. **47.** 22 yd.; 66 ft.; 792 in. **48.** $.46. **49.** 7⅓ ft.; 468 sq. in. **50.** $15. **51.** $11.77½. **52.** 75,273,334. **53.** $13.

FIFTH YEAR

Page 189. – **16.** $6\frac{1}{4}$ in. **17.** $13\frac{2}{3}$ yd. **18.** $2\frac{3}{4}$ ft. **19.** $11\frac{1}{6}$ ft. **20.** $9\frac{1}{2}$ ft. **21.** 19 yd. **22.** 4 ft. **23.** $46\frac{3}{4}$ ft.

Page 191. – **14.** $\$5\frac{3}{10}$. **15.** $29\frac{4}{5}$ mi. **16** $\$16\frac{1}{2}$. **17.** $9\frac{2}{5}$. **18.** $34\frac{1}{5}$ mi. **19.** $\$62\frac{3}{10}$. **20.** $90\frac{1}{5}$. **21.** $32\frac{5}{8}$ da. **22.** $\$1\frac{1}{10}$. **23.** $12\frac{2}{15}$ hr. **24.** $\$4\frac{3}{10}$. **25.** $36\frac{8}{15}$ min.

Page 192. – **10.** $14\frac{1}{2}$ ft. **11.** $64\frac{1}{16}$ ft. **12.** $49\frac{7}{8}$. **13.** $30\frac{13}{16}$. **14.** $\$4\frac{1}{4}$. **15.** $5\frac{11}{16}$ yd. **16.** $4\frac{5}{16}$ mi. **17.** $16\frac{9}{16}$. **18.** $15\frac{2}{3}$ ft. **19.** 54 rd.

Page 193. – **12.** $106\frac{5}{6}$. **13.** $43\frac{11}{16}$. **14.** $104\frac{35}{36}$. **15.** $24\frac{5}{9}$. **16.** $98\frac{13}{16}$ ft. **17.** $75\frac{4}{5}$ mi. **18.** 50 bu. **19.** $35\frac{2}{3}$ da. **20.** $2\frac{1}{4}$. **21.** $2\frac{5}{18}$. **22.** $2\frac{7}{12}$. **23.** $2\frac{1}{12}$. **24.** $2\frac{7}{12}$ in. **25.** $2\frac{11}{18}$ bu. **26.** $4\frac{1}{4}$ lb. **27.** $10\frac{1}{4}$ da.

Page 194. – **9.** $77\frac{7}{24}$ in. **10.** $84\frac{17}{24}$ bu. **11.** $71\frac{19}{24}$. **12.** $88\frac{13}{24}$. **13.** $2\frac{1}{12}$ yd. **14.** $7\frac{5}{12}$ da. **15.** $15\frac{3}{8}$. **16.** $31\frac{13}{24}$.

Page 196. – **2.** $\frac{5}{10}$, $\frac{4}{10}$. **3.** $\frac{9}{12}$, $\frac{10}{12}$. **4.** $\frac{16}{24}$, $\frac{15}{24}$. **5.** $\frac{16}{36}$, $\frac{9}{36}$. **6.** $\frac{4}{8}$, $\frac{6}{8}$, $\frac{3}{8}$. **7.** $\frac{4}{6}$, $\frac{3}{6}$, $\frac{5}{6}$. **8.** $\frac{6}{18}$, $\frac{4}{18}$, $\frac{4}{18}$. **9.** $\frac{20}{24}$, $\frac{9}{24}$, $\frac{1}{24}$. **11.** $\frac{1}{3}$. **12.** $\frac{1}{3}$. **13.** $\frac{2}{5}$. **14.** $\frac{1}{4}$. **15.** $\frac{1}{2}$. **16.** $\frac{2}{3}$. **17.** $\frac{2}{5}$. **18.** $\frac{2}{5}$. **19.** $\frac{1}{3}$. **20.** $\frac{3}{7}$. **23.** 2. **24.** $1\frac{1}{2}$. **25.** $1\frac{2}{3}$. **26.** 9. **27.** $4\frac{1}{4}$.

Page 199. – **2.** $\frac{5}{6}$. **3.** $\frac{2}{3}$. **4.** $\frac{7}{12}$. **5.** $\frac{3}{4}$. **6.** $\frac{10}{21}$. **7.** $\frac{9}{14}$. **8.** $\frac{5}{12}$. **9.** $\frac{5}{8}$. **10.** $\frac{9}{20}$. **11.** $\frac{8}{15}$. **12.** $\frac{11}{28}$. **13.** $\frac{5}{8}$. **14.** $\frac{1}{2}$. **15.** $\frac{11}{30}$. **16.** $\frac{5}{12}$. **17.** $\frac{7}{10}$. **18.** $\frac{4}{9}$. **19.** $\frac{1}{4}$. **20.** $\$\frac{9}{20}$. **21.** $1\frac{1}{12}$ yd. **22.** $\$\frac{19}{20}$.
2. $12\frac{5}{6}$. **3.** $28\frac{7}{12}$. **4.** $29\frac{3}{4}$. **5.** $137\frac{1}{2}$.

Page 200. – **6.** $58\frac{4}{5}$. **7.** $72\frac{1}{2}$. **8.** $148\frac{2}{5}$. **9.** $395\frac{7}{16}$. **10.** $385\frac{4}{5}$. **11.** $158\frac{7}{20}$. **12.** $23\frac{11}{18}$. **13.** $140\frac{3}{4}$. **14.** $8\frac{5}{6}$ mi. **15.** $\$66\frac{11}{20}$.
2. $16\frac{1}{6}$. **3.** $219\frac{3}{8}$. **4.** $99\frac{1}{2}$. **5.** $92\frac{11}{12}$. **6.** 192. **7.** 1038. **8.** $43\frac{5}{18}$. **9.** $50\frac{2}{5}$.

Page 201. – **10.** 153. **11.** $109\frac{11}{16}$. **12.** $671\frac{1}{5}$. **13.** $470\frac{8}{15}$. **14.** $\$1\frac{1}{5}$. **15.** \$33. **16.** $4\frac{2}{5}$ A. **17.** $28\frac{3}{4}$ in.

Page 202. – **2.** $1\frac{1}{6}$. **3.** $3\frac{1}{4}$. **4.** $3\frac{7}{12}$. **5.** $9\frac{1}{5}$. **6.** $5\frac{4}{7}$. **7.** $30\frac{7}{10}$. **8.** $4\frac{8}{11}$. **9.** $2\frac{4}{9}$. **10.** $5\frac{1}{5}$. **11.** $4\frac{3}{7}$.

Page 203. – **12.** $\frac{2}{5}$¢. **13.** $\$\frac{3}{10}$. **14.** $\$\frac{1}{2}$. **15.** $9\frac{1}{12}$ in. **16.** $13\frac{7}{16}$ A.
2. $\frac{1}{6}$. **3.** $\frac{1}{20}$. **4.** $\frac{1}{12}$. **5.** $\frac{3}{8}$. **6.** $\frac{4}{21}$. **7.** $\frac{1}{24}$. **8.** $\frac{7}{18}$. **9.** $\frac{2}{15}$. **10.** $\frac{1}{42}$. **11.** $\frac{1}{24}$. **12.** $\frac{2}{9}$. **13.** $\frac{3}{28}$. **14.** $\frac{4}{45}$. **15.** $\frac{5}{14}$. **16.** $\frac{1}{4}$. **17.** $\frac{1}{8}$. **18.** $\frac{1}{30}$. **19.** $\frac{1}{12}$. **20.** $\frac{1}{10}$. **21.** $\frac{3}{40}$. **22.** $\frac{7}{12}$.

Page 204. – **23.** $\frac{1}{4}$ yd. **24.** $\frac{1}{16}$ A. **25.** $\frac{1}{20}$ of the distance. **27.** $2\frac{1}{2}$. **28.** $11\frac{1}{3}$. **29.** $17\frac{1}{8}$. **30.** $8\frac{1}{6}$. **31.** $2\frac{3}{7}$. **32.** $99\frac{1}{10}$. **33.** $17\frac{1}{15}$. **34.** $21\frac{1}{12}$. **35.** $6\frac{2}{3}$. **36.** $27\frac{3}{14}$. **37.** $54\frac{3}{16}$. **38.** $3\frac{1}{20}$. **39.** $124\frac{17}{18}$. **40.** $9\frac{1}{5}$. **41.** $132\frac{1}{9}$. **42.** $43\frac{23}{25}$. **43.** $10\frac{1}{4}$. **44.** $39\frac{2}{5}$. **45.** $6\frac{3}{11}$. **46.** $50\frac{3}{10}$. **47.** $47\frac{1}{8}$. **48.** $\$1\frac{1}{5}$. **49.** $7\frac{1}{8}$ gal. **50.** $9\frac{1}{4}$ bu.

Page 205. — **52.** $1\frac{1}{4}$. **53.** $3\frac{1}{6}$. **54.** $7\frac{1}{2}$. **55.** $8\frac{1}{8}$. **56** $7\frac{1}{9}$. **57.** $13\frac{3}{10}$. **58.** $13\frac{1}{12}$. **59.** $53\frac{3}{16}$. **60.** $62\frac{5}{21}$. **61.** $55\frac{7}{20}$. **62.** $66\frac{1}{8}$. **63.** $66\frac{5}{9}$. **64.** $15\frac{1}{10}$. **65.** $13\frac{7}{36}$. **66.** $48\frac{4}{21}$. **67.** $43\frac{1}{15}$. **68.** $10\frac{7}{15}$. **69.** $12\frac{4}{33}$. **70.** $40\frac{8}{15}$. **71.** $7\frac{3}{8}$. **72.** $12\frac{3}{8}$ A. **73.** $2\frac{4}{15}$ hr. **74.** $\$7\frac{1}{4}$. **75.** $\frac{7}{20}$ mi.
1. $\$1\frac{1}{5}$. **2.** $5\frac{1}{2}$ ft. **3.** $\$2\frac{13}{20}$.

Page 206. — **4.** $\$2\frac{13}{20}$. **5.** 1 ft. **6.** $7\frac{3}{4}$ ft. **7.** $8\frac{1}{2}$ T. **8.** $12\frac{1}{20}$ in. **9.** $8\frac{1}{2}$ gal. **10.** $\$24\frac{13}{20}$. **11.** $29\frac{1}{8}$ mi. **12.** $45\frac{5}{7}$. **13.** $8\frac{5}{12}$. **14.** $\$19\frac{9}{10}$. **15.** $8\frac{1}{4}$ mi. **16.** $\$30\frac{19}{20}$.

Page 207. — **17.** $\$5\frac{9}{10}$. **18.** $\$39\frac{9}{20}$. **19.** $\$21\frac{17}{20}$. **20.** $43\frac{9}{20}$ hr.; $28\frac{11}{20}$ hr.

Page 209. — **1.** \$900. **2.** 1000 A.; 1000 A.; 500 A.

Page 210. — **3.** 292 da. **4.** \$160. **5.** \$5460. **6.** 9200 girls; 5520 boys. **7.** \$35. **8.** \$648. **9.** \$5800.

Page 211. — **1.** 27 pupils. **2.** \$24. **3.** 30 words. **4.** 49 lambs. **5.** 180 da. **6.** \$120. **7.** \$600. **8.** \$225. **9.** 66 mi. **10.** \$5060.

Page 212. — **11.** 442 mi. **12.** 72 ft.

Page 213. — **2.** 36. **3.** 45. **4.** 24. **5.** 45. **6.** 36. **7.** 32. **8.** 102. **9.** 51. **10.** 18. **11.** 24. **12.** 45. **13.** 108. **14.** 575. **15.** 2685. **16.** 1826. **17.** 640. **18.** 1320. **19.** 360. **20.** 2325. **21.** 1768. **22.** 1470. **23.** 720. **24.** 1750. **25.** 376. **26.** 1425. **27.** 825. **28.** 3030.

Page 214. — **29.** \$150. **30.** \$525. **31.** \$3.75 cost; \$2.25 gain. **32.** \$2.80. **33.** \$.50. **34.** \$2.30. **35.** \$3. **36.** 500 mi. **37.** \$845. **38.** 99 cd. **39.** \$257.25. **40.** \$679.

Page 215. — **41.** \$15,000. **42.** \$5680. **43.** \$1.35. **44.** $268\frac{1}{8}$ rd. **45.** $7401\frac{1}{4}$ mi. **46.** $1409\frac{3}{16}$ T.

Page 217. — **3.** 45. **4.** 138. **5.** 326. **6.** 4805. **7.** 10,805. **8.** 1100. **9.** 3927. **10.** 6006. **11.** 4284. **12.** 1704. **13.** 9729. **14.** 15,606. **15.** 9004. **16.** 3241. **17.** 2005. **18.** 2315. **19.** 2499. **20.** 3027. **21.** 8165. **22.** 14,885. **23.** 114. **24.** 144. **25.** 249. **26.** 645. **27.** 3996. **28.** 2012. **29.** 14,895. **30.** 2092. **31.** 6276. **32.** 5615. **33.** 2476. **34.** 4900. **35.** 470. **36.** 208. **37.** 7990. **38.** 4104. **39.** 348. **40.** 1020. **41.** 5971. **42.** 196. **43.** 357. **44.** 1687. **45.** 438 mi. **46.** \$73.50. **47.** \$24.75. **48.** \$220.

Page 218. — **49.** \$1.86. **50.** \$1.74. **51.** \$94. **52.** \$138. **53.** \$201. **54.** 660 mi. **55.** \$4809. **56.** $\$78\frac{3}{4}$.

Page 219. — **2.** $\frac{25}{72}$. **3.** $\frac{32}{63}$. **4.** $\frac{16}{35}$. **5.** $\frac{15}{64}$. **6.** $\frac{20}{33}$. **7.** $\frac{27}{35}$. **8.** $\frac{16}{21}$. **9.** $\frac{32}{45}$. **10.** $\frac{20}{63}$. **11.** $\frac{5}{22}$. **12.** $\frac{12}{49}$. **13.** $\frac{27}{50}$. **15.** $4\frac{1}{6}$. **16.** $8\frac{2}{5}$. **17.** $4\frac{4}{9}$. **18.** $10\frac{5}{6}$. **19.** $2\frac{17}{32}$. **20.** $5\frac{5}{8}$. **21.** $33\frac{7}{20}$. **22.** $120\frac{5}{6}$. **23.** $60\frac{15}{16}$. **24.** $52\frac{1}{2}$. **25.** $33\frac{1}{3}$. **26.** $156\frac{1}{4}$. **27.** $26\frac{1}{4}$¢. **28.** $159\frac{3}{8}$¢. **29.** $142\frac{3}{8}$¢.
1. \$2. **2.** \$2.97.

Page 220. — **3.** \$6.03. **4.** $\$138\frac{1}{4}$. **5.** $\$141\frac{3}{4}$. **6.** \$3.75. **7.** \$8.16. **8.** \$4.02. **9.** \$38.06. **10.** \$3.50. **11.** $\$301\frac{7}{8}$. **12.** $\$38.26\frac{1}{4}$. **13.** $\$10.81\frac{1}{4}$. **14.** $663\frac{1}{4}$ lb. **15.** 142 mi. **16.** 147 mi.

Page 221. — **2.** $2\frac{6}{7}$. **3.** $9\frac{3}{8}$. **4.** 12. **5.** $10\frac{1}{2}$. **6.** $1\frac{1}{2}$. **7.** $71\frac{1}{2}$. **8.** 105. **9.** 49. **10.** $3\frac{1}{4}$. **11.** 85. **12.** $33\frac{3}{4}$. **13.** $37\frac{1}{2}$. **14.** 54. **15.** $199\frac{4}{5}$. **16.** \$$5\frac{3}{5}$. **17.** \$144. **18.** $354\frac{2}{3}$ mi. **19.** \$$34\frac{2}{5}$. **20.** \$$81\frac{3}{5}$.

Page 224. — **2.** 18. **3.** $5\frac{5}{8}$. **4.** 10. **5.** $3\frac{1}{3}$. **6.** $4\frac{1}{4}$. **7.** $16\frac{2}{3}$. **8.** 2. **9.** 40. **10.** 12. **11.** $3\frac{3}{4}$. **12.** $7\frac{1}{2}$. **13.** $2\frac{1}{2}$. **14.** $2\frac{1}{2}$. **15.** $2\frac{14}{15}$. **16.** 9. **17.** 4. **18.** $7\frac{1}{6}$. **19.** $3\frac{1}{6}$. **20.** \$.16. **21.** \$5. **22.** 30. **23.** \$.12.

Page 225. — **2.** 3. **3.** 4. **4.** 3. **5.** 4. **6.** $6\frac{2}{7}$. **7.** $1\frac{1}{3}$. **8.** 2. **9.** 5. **10.** $1\frac{3}{10}$. **11.** $1\frac{22}{63}$. **12.** $\frac{49}{58}$. **13.** $\frac{10}{11}$. **14.** $\frac{1}{3}$. **15.** $1\frac{1}{11}$. **16.** $1\frac{2}{5}$. **17.** $2\frac{13}{21}$. **18.** $1\frac{1}{2}$. **19.** $1\frac{11}{25}$. **20.** 16 vests. **21.** 7 pictures. **22.** 24 yd. **23.** 16 gal. **24.** 12 hats. **25.** 12 lamps. **26.** \$$\frac{4}{5}$. **27.** 3. **28.** 7.

Page 227. — **2.** 27. **3.** 40. **4.** 36. **5.** 49. **6.** 40. **7.** 77. **8.** 63. **9.** 72. **10.** 81. **11.** 100. **12.** 96. **13.** 117. **14.** 144. **15.** 108. **16.** 60. **17.** 225. **18.** 171. **19.** 910. **20.** 204. **21.** 405. **22.** 504. **23.** 10. **24.** 12. **25.** 9. **26.** 10. **27.** 16. **28.** 16. **29.** 9. **30.** 20. **31.** 27. **32.** 24. **33.** 40. **34.** 45. **35.** 42. **36.** 100. **37.** 40. **38.** 45. **39.** 204. **40.** 63. **41.** 80. **42.** $3\frac{3}{5}$. **43.** $3\frac{3}{8}$. **44.** $4\frac{8}{9}$. **45.** $3\frac{1}{5}$. **46.** $4\frac{1}{3}$. **47.** $3\frac{1}{5}$. **48.** $4\frac{1}{5}$. **49.** $5\frac{5}{8}$. **50.** $2\frac{1}{4}$.

Page 228. — **1.** $1\frac{1}{2}$. **2.** 2. **3.** $2\frac{1}{2}$. **4.** $1\frac{1}{2}$. **5.** $1\frac{1}{11}$. **6.** $15\frac{21}{32}$. **7.** $\frac{72}{95}$. **8.** $2\frac{1}{2}$. **9.** $3\frac{1}{3}$. **10.** $4\frac{1}{7}$. **11.** $12\frac{3}{5}$. **12.** $1\frac{2}{5}$. **13.** $1\frac{11}{21}$. **14.** $2\frac{2}{15}$. **15.** $3\frac{31}{75}$. **16.** $\frac{3}{4}$. **17.** $\frac{31}{44}$. **18.** $2\frac{3}{10}$. **19.** $3\frac{1}{6}$. **20.** $12\frac{1}{2}$. **21.** 7. **22.** $3\frac{6}{23}$. **23.** $\frac{43}{66}$. **24.** $43\frac{7}{11}$. **25.** $4\frac{29}{11}$. **26.** $8\frac{9}{16}$. **27.** $13\frac{3}{4}$. **28.** $\frac{5}{13}$. **29.** $2\frac{22}{25}$. **30.** $\frac{1}{15}$. **31.** \$$205.03\frac{7}{16}$. **32.** \$$631\frac{1}{8}$. **33.** \$$2105\frac{5}{6}$. **34.** 126 badges.

Page 229. — **35.** \$11,340. **36.** 70. **37.** \$1.35. **39.** $\frac{3}{4}$. **40.** $\frac{11}{72}$. **41.** 50 ft. **42.** \$60. **43.** $20\frac{1}{2}$ rd. **44.** $25\frac{23}{75}$ mi. **45.** $434\frac{1}{72}$ lb. **46.** 2112 steps. **47.** $929\frac{13}{16}$ lb.

Page 232. — **1.** \$$18\frac{1}{20}$. **2.** \$$12\frac{3}{4}$. **3.** $17\frac{1}{2}$ yd. **4.** \$40.50. **5.** 9 yd. **6.** 157 lb. **7.** \$4125. **8.** 46 da. **9.** \$370, son; \$1480, daughter; \$1665, widow; \$925, hospital. **10.** $81\frac{1}{3}$ yd. **11.** $100\frac{1}{6}$ hr.

Page 233. — **12.** \$4128. **13.** 16. **14.** 450. **15.** \$$3.31\frac{1}{4}$. **16.** \$24. **17.** \$54. **18.** 79 families. **19.** \$11.60. **20.** \$3.90. **21.** $25\frac{11}{12}$. **22.** \$.18. **23.** $31\frac{11}{12}$. **24.** \$35.95.

Page 234. — **25.** \$5. **26.** $8\frac{1}{3}$ yd. **27.** 12. **28.** 15 mi. **29.** $75\frac{1}{4}$ A. **30.** \$124. **31.** 48 books. **32.** \$38. **33.** \$$38\frac{1}{4}$. **34.** \$49. **35.** 50 chairs. **36.** $4\frac{7}{8}$ yd. **37.** $14\frac{1}{8}$ yd. **38.** \$5.25. **39.** 232 pencils.

Page 235. — **40.** 15 coats. **41.** $105\frac{3}{4}$ lb. **42.** $57\frac{5}{8}$ bu. **43.** 312 yd. **44.** $25\frac{1}{9}$ da. **45.** $106\frac{3}{4}$ bu. **46.** \$.20. **47.** \$81. **48.** \$800. **49.** \$.55. **50.** 220 sheep. **52.** 33 bu. **53.** $35\frac{1}{2}$; $2\frac{13}{36}$; $6\frac{3}{8}$. **54.** \$.20.

Page 240. — **2.** $\frac{3}{20}$. **3.** $\frac{33}{40}$. **4.** $\frac{9}{10}$. **5.** $\frac{13}{40}$. **6.** $\frac{3}{4}$. **7.** $\frac{1}{40}$. **8.** $\frac{1}{8}$. **9.** $\frac{17}{40}$. **12.** .25; .75; .125; .375. **13.** $\frac{9}{20}$. **14.** $\frac{5}{8}$. **15.** $\frac{3}{4}$. **16.** $\frac{13}{20}$. **17.** $\frac{3}{8}$. **18.** $\frac{4}{5}$. **19.** $\frac{1}{5}$. **20.** $\frac{3}{5}$. **21.** $\frac{1}{8}$. **22.** $\frac{9}{10}$. **23.** $\frac{24}{25}$. **24.** $\frac{18}{25}$. **25.** $\frac{2}{5}$. **26.** $\frac{12}{25}$. **27.** $\frac{3}{20}$. **28.** $\frac{1}{2}$. **29.** $\frac{1}{40}$. **30.** $\frac{2}{25}$. **31.** $\frac{3}{40}$. **32.** $\frac{1}{40}$. **33.** $\frac{3}{25}$. **34.** $\frac{9}{40}$. **35.** $\frac{7}{10}$. **36.** $\frac{4}{5}$.

Page 241. — **2.** 1.015. **3.** .221. **4.** .256. **5.** 9.1. **6.** 13.189. **7.** .0311. **8.** 18.027. **9.** .0922.

Page 242.—**10** 44.85. **11.** 2.9. **12.** 17.165. **13.** 33.793. **14.** 26.676. **15.** 14.806, **16.** 143.192. **17.** 137.768. **18.** 2171.812. **19.** 225.303. **20.** 47.97. **21.** 2.75 bu. **22.** $4.94. **23.** 82.1 mi. **24.** 5.25 lb. **25.** 23.93 mi.

Page 243.—**2.** 5.79. **3.** 12.954. **4.** .305. **5.** 180.892. **6.** 16.02. **7.** 72.927. **8.** 695.725. **9.** 18.835. **10.** 131.745. **11.** 38.615. **12.** 32.996. **13.** 108.967. **14.** $3.75. **15.** 5.375 mi. **16.** 55 75 A. **17.** $2.20.

Page 244.—**18.** 10.86 ft. **19.** 28.46 ft. **20.** $2.05. **21.** 6.75 lb. **22.** 5.125 lb. **23.** .375 lb. **24.** 27.6 T. **25.** 6.75 yd. **26.** $6.32. **27.** $4.35

Page 245.—**2.** .12. **3.** .045. **4.** 1.36. **5.** 2.277. **6.** 6.79. **7.** .3. **8.** 3.624. **9.** .486. **10.** 74.046. **11.** 2.738. **12.** 61.64. **13.** 31.02. **14.** 3.63. **15.** 18.213. **16.** 4.56. **17.** 2.916.

Page 246.—**18.** $5.74. **19.** $8.40. **20.** 148.5 ft. **21.** $94.90 **22.** $14.49. **23.** 248.5 mi.

NOTE. In business problems count 5 mills or more as an additional cent.

Page 247.—**2.** .216. **3.** .225. **4.** .0384. **5.** 65. **6.** 53.58. **7.** 14.445. **8.** 57.92. **9.** .462. **10.** .0855. **11.** .812. **12.** 6.960. **13.** 1710. **14.** 3.1. **15.** 90.9. **16.** .468. **17.** 7.92. **18.** 153.6. **19.** 58.52. **20.** $1.44. **21.** $.72. **22.** $51.56. **23.** 481.95 mi. **24.** 17.0625 mi. **25.** $8.97; $15.53. **26.** $65. **27.** 796.875 lb.

Page 248.—**2.** .11. **3.** .32. **4.** .101. **5.** .102. **6.** .107. **7.** .212. **8.** .121. **9.** .156. **10.** .112. **13.** .075. **14.** .075. **15.** .045. **16.** .056. **17.** .3. **18.** .3. **19.** .02. **20.** .001. **21.** .002. **22.** .03. **23.** .05. **24.** .03. **25.** .004. **26.** .034. **27.** .003. **28.** .012. **29.** .005. **30.** .009. **31.** .113. **32.** .072. **33.** .036. **34.** .04. **35.** .025. **36.** .04. **37.** .05. **38.** .007. **39.** .011. **40.** .006.

Page 249.—**6.** 3.04. **7.** 2.11. **8.** 6.1. **9.** 22.3. **10.** .101. **11.** 3.4. **12.** .039. **13.** .124. **14.** .027. **15.** 1.16. **16.** .022. **17.** .036. **18.** .14. **19.** .0017. **20.** .029. **21.** .038. **22.** .143. **23.** 6.14. **24.** 6.04. **25.** .089. **26.** .475. **27.** .605. **28.** .065. **29.** .0904.

Page 250.—**31** .266+. **32** .4. **33.** .105+. **34.** .08. **35.** .444+. **36.** .5. **37.** .2. **38.** .5. **39.** .5. **40.** .25. **41.** .125. **42.** .0124+.

Page 251.—**2.** .65. **3.** .84. **4.** 8.7. **5.** .74. **6.** 7.4. **7.** 8.5. **8.** 7.7 **9.** 8.4. **10.** 8.2. **11.** 9.4. **12.** .87. **13.** .75. **14.** 49. **15.** 89. **16.** 8.4. **17.** .83. **18.** 9.5. **19.** 760. **20.** .05. **21.** 45. **22.** 8.6. **23.** 9.6. **24.** 2.8. **25.** 870. **26.** 670. **27.** 9.2. **28.** 32.1.

Page 252.—**29.** .001. **30.** 12.5. **31.** 1.11. **32.** 144. **33.** 50.6. **34.** 233. **35.** 3.6. **36.** 17.4. **37.** 27.9. **38.** 266.9. **39.** 32.6. **40.** 42.4. **41.** 37.5. **42.** 82.3. **43.** 56.1. **44.** 28.3. **45.** 43.6. **46.** 38.4.

1. 5. **2.** 483.9577. **3.** $1.05. **4.** 365 da. **5.** 4.25 T. **6.** 19.2 A. **7.** 85.375 T. **8.** 29. **9.** $140.63.

Page 253.—**10.** 2240.8 mi. **11.** $1.69. **12.** 142 pieces. **13.** 1.375 carats. **14.** 16.625 lb. **15.** 1.5 T. **16.** 6 qt. **17.** $20. **18.** 354 ft. **19.** $133.09. **20.** 220 bbl. **21.** 1000.

Page 256. — **2.** $106.65. **3.** $66.92. **4.** $126.48. **5.** $3.44. **6.** $4.54.
7. $31.71. **8.** $8.20. **9.** $200.40. **10.** $10.03. **11.** $35.04. **12.** $453.75.
13. $741.85. **14.** $3035.25. **15.** $724. **16.** $6867.84. **17.** $157.50.
18. $33. **19.** 594 mi. **20.** $1027. **21.** $50.

Page 257. — **22.** 403.2 rd. **23.** $386.90. **24.** $140. **25.** 1; 2; 2.5; 3; 4.
26. $7.20. **27.** $6. **28.** $10. **29.** $128. **30.** 225 sheep. **31.** 24 words.
33. $616. **34.** $5075.

Page 259. — **2.** $10. **3.** $144. **4.** $27. **5.** $112. **6.** $9. **7.** $15.36.
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$365.75. **22.** $287.50.

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7. $121.50. **8.** $13.30. **9.** $6.38. **11.** 46 pairs. **12.** $116\frac{2}{3}$ bu.

Page 262. — **13.** 4 doz. **14.** $90. **15.** $16.50. **16.** $40.55. **17.** $3.60.
18. 25 yd.

Page 263. — **1.** $3.25. **2.** $1.73. **3.** $3.03. **4.** $10.45. **5.** $6.56.

Page 264. — **6.** $4.65. **7.** $3.98. **8.** $31.09. **9.** $21.17.

Page 265. — **1.** $7. **2.** $10.95. **3.** $84.62.

Page 267. — **2.** 49 pt. **3.** 67 pt. **4.** 38 pt. **5.** 45 pt. **6.** 7 pt.
7. $2.80. **8.** $4. **10.** 187 qt. 1 pt. **11.** 423 qt. **12.** 34 gal. 3 qt.
13. 84 gal. 1 qt. 1 pt. **14.** 117 gal. 1 qt. **15.** 1750 pt. **16.** 52 qt.
17. 1152 pt.

Page 268. — **1.** 236 pt. **2.** $1\frac{1}{2}$ bu. **3.** $37\frac{1}{2}$ bu. **4.** $16\frac{1}{4}$ bu. **5.** 561 pt.
6. $23\frac{7}{16}$ bu.

Page 270. — **1.** 101 oz. **2.** 6800 lb. **3.** 6448 oz. **4.** 8800 oz.
5. 36 cwt. **6.** 64,080 oz. **7.** 34 lb. **8.** 3 T. **9.** 8 lb. **10.** 50 lb. 10 oz.

Page 271. — **1.** 11,160 sec. **2.** $1\frac{2}{3}$ da. **3.** 7380 min. **4.** 3240 da.
5. 2160 hr. **6.** 2 wk. **7.** 4 da. **8.** 2,592,000 sec. **9.** 19,800 sec.

Page 272. — **10.** $21. **11.** $10.80. **12.** $58.50. **13.** $21.

Page 273. — **1.** 396 in. **2.** 36 ft. **3.** 154 yd. **4.** 31,680 in.
5. 138 in. **6.** 76 ft. **7.** 48 yd. **8.** 1 rd.

Page 274. — **1.** 4320 turns. **2.** $10.08. **3.** 88 rd. **4.** 108 lb.; 9 lb.
5. 1 gal. 1 qt. 1 pt. **6.** $145.20. **7.** $9\frac{5}{24}$ lb. **8.** $63. **9.** 34 doz.
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Page 275. — **13.** $3.02 change. **14.** $6.20. **15.** $21. **16.** 208 cans.
17. \$$3\frac{1}{3}$; \$$.06\frac{2}{3}$. **18.** $5.75. **19.** 79 lb. **20.** $3.78. **21.** 70 yr
22. 12 T. 41 lb.

Page 277. — **1.** 120 sq. in. **2.** $26\frac{2}{3}$ sq. ft. **3.** 3650 sq. ft. **4.** $36\frac{1}{4}$ sq. in. **8.** $24. **9.** $42.63. **10.** $6\frac{3}{4}$ sq. ft. **11.** $2.99. **12.** Second is 110 sq. in. larger. **13.** $37.50.

Page 278. — **14.** $76.50. **15.** $192.50. **16.** $\frac{1}{4}$ of it. **17.** $\frac{1}{4}$ as large.

Page 280. — **4.** 19,200 cu. ft. **5.** $711\frac{1}{9}$ cu. yd. **6.** 12 cu. ft.

Page 281. — **7.** 384 cubes. **8.** 40 sq. ft. **9.** 27,648 cu. in. **10.** 480 cu. ft. **11.** 385.7106+ bu. **12.** 6000 lb. **13.** 320 cu. ft. **15.** 18 sq. ft.

Page 282. — **19.** 1728 cu. in. **21.** 18 cu. ft. **22.** 27 cu. in. **23.** 64 cu. in. **24.** 8 cu. in. **25.** 8 times. **26.** 24 cu. in. **27.** 4 sq. in. **28.** 25 more. **29.** $26.67. **30.** $13\frac{8}{9}$ loads; $4.17.

Page 283. — **1.** $2.08. **2.** $6.27. **3.** 102,700. **4.** $135. **5.** $12\frac{1}{2}$. **6.** $.18. **7.** 6 aprons. **8.** Four thousand six and fifteen thousandths. **9.** 75 A. **10.** $240. **11.** 101 pt. **12.** 35 mi. **13.** $37\frac{3}{4}$ yd.

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Page 285. — **31.** $8.64. **32.** (1) 51.2 yd.; 53.76 yd.; 42 yd.; (2) 72 gal.; 219.6 gal.; 27 gal.; (3) 12 bu.; 45 bu.; 58 bu. **33.** $4.53. **34.** $4.62. **35.** $288. **36.** 84 lb. **37.** $28.80. **38.** $379.17. **39.** 195 yd. **40.** $1664. **41.** $92\frac{3}{8}$ lb.

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Page 287. — **56.** \$$1\frac{1}{2}$. **57.** Mary, \$$\frac{11}{20}$. **58.** \$$11\frac{3}{4}$. **59.** 4. **60.** $486.10. **61.** 70 pk. **62.** 1000. **63.** 72. **64.** 103 pk. **65.** $17.40. **66.** 4 times; $3\frac{1}{3}$ times; $33\frac{1}{3}$ times. **67.** $67.50. **68.** $30.50.

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